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REAR-ADM. G. B. BALCH, U. S. N., in the Chair.

THE FLEETS OF THE WORLD—THE SAIL PERIOD.

By the late COMMO. FOXHALL A. PARKER, U. S. N.

After the defeat of the Spanish Armada, with which, as the close of the galley period, our first volume necessarily ended, England fitted out many expeditions against the possessions and commerce of Spain, which, if not always successful, served, nevertheless, to foster a spirit of maritime enterprise among her people, and to impress foreign nations with exalted ideas of the daring and resolute character of British seamen, who, even when overpowered, ten to one, disdained to strike their colors, while they had a shot in the locker, or an ounce of powder in the magazine. A notable instance of this obstinate courage occurred in 1591, when Vice-Admiral Greenville, in the Revenge—a vessel famous from having borne the flag of Drake—withstood, for sixteen hours, the attack of "a whole Spanish fleet of fifty three sail and ten thousand men." Finding it impossible to resist longer, the heroic admiral prepared to set fire to the magazine; but, being prevented from so doing by his crew, he was forced to surrender, after having received three wounds, two of which were mortal. He expired calmly, a few days after the action, his last words being, "Here die I, Richard Greenville, with a joyful and quiet mind; for that I have ended my life as a true soldier ought to do, fighting for his country, queen, religion, and honor; my soul willingly departing from my body."

Depending more and more on sails for propulsion, the man-of-war of the sixteenth century had undergone a gradual transformation, in model, armament, mastage, and rigging, until it had become such as is made known to us by Charnock, in his description of the Great Harry. In Protestant England a change had taken place, too, in the names of vessels, and in the habits and customs of seamen; the saintly appellations, in vogue in Queen Mary's time, having given place to such names as The Dreadnaught, The Defiance, The Water-Sprite, and The Mermaid, while the coaster, no longer lowering his sails nor dipping his flag to the shrine of Our Lady of Bradestow, seemed disposed to rely rather upon himself than upon Our Lady, or even his Patron Saint, for protection, when buffeted by the waves and winds of the tempestuous British channel.

In 1603, when James the First ascended the throne, and peace was concluded with Spain, British merchants, who, until then, had been in the habit of transporting their wares to and from foreign countries in English bottoms, began to hire vessels from all nations for this service, and, notwithstanding that the Corporation of the Trinity, in 1615, in a petition to the king, showed that such had been the decline of British shipping, in consequence of this impolitic custom, that there were not then more than ten ships belonging to the port of London of over two hundred tons burthen, it was unable, through the opposition of the mercantile community, to get an act passed prohibiting it. On a certain day, however, two London merchants, "more observant than their brethren," while walking along the banks of the Thames, chanced to see two Dutch ships, "laden with coffee and cotton (the property of Hollanders resident in Great Britain"), dropping their anchors off the city. The vessels were of large size, and, being well manned and armed, presented a formidable appearance; and the idea seemed to seize the two Englishmen, at the same moment, that, while the Flemish traders, by their wise conduct, were creating a powerful merchant marine, which, besides serving as a nursery for their seamen, must prove a most valuable acquisition to the Navy of Holland, in time of war, they, by their unwise course, were actually exposing their coast, in the event of a rupture with one of the great maritime powers, to blockade, and perhaps even to invasion.

"The idea spread like wild fire:" and such was the change of opinion, among the whole body of the merchants, that "the nation, with one accord, sedulously applied itself to the creation of a civil Navy;" so that, in 1622, there were belonging to Newcastle alone one

hundred large vessels. The East India Company, too, which had received its first patent from Queen Elizabeth, in 1600, had now become an exceedingly powerful and influential corporation, and, with its capital of five hundred thousand pounds sterling, maintained a fleet of fine ships, all of which were well armed and many of great size, one in particular having a capacity of eleven hundred tons.

Inclined to peace as he was by nature, James had the good sense to see that he could only secure it by being prepared for war, and that a Navy was all important to the safety of England; and, as he was possessed of an inquiring mind which led him to pursue with avidity scientific investigation, he perceived, further, that the plans for the construction of vessels of war submitted to him by Phineas Pett, "gentleman, and some time Master of Arts at Emanuel College, Cambridge," were far in advance of those of the shipwrights of his kingdom. He therefore intrusted to him the building of "the greatest and goodliest vessel," according to Stone, "that had yet been builded in England." She was called the Prince Royal, and Charnock speaks of her as "the parent of the identical class of shipping which continued in use up to his day" (1802). "Were the absurd profusion of ornament", he goes on to remark, "removed, the contour or general appearance of the ships would not so materially differ from the modern vessels of the same size, as to render it an uncommon sight, or a ship that a mariner would hesitate to put to sea in."

Besides the Royal Prince, Pett built a number of smaller vessels, by order of the king, who, during his reign, "augmented the Royal Navy one fourth part." Charles the First also added to it several fine ships, of which "the most goodly by far" was The Sovereign of the Seas, thus described by Thomas Heywood, in his tract entitled—A true Description of his Majesty's royal ship, built this year, 1637, at Woolwich, in Kent, to the Great Glory of the English nation, and not to be paralleled in the whole Christian world:

"Upon the beak head sitteth royall King Edgar on horseback, trampling upon seven Kings; now what he was, and who they were, I shall briefly relate unto you, rendering withall a full satisfactory reason to any impartiall reader why they are there, and in that manner placed.

Upon the stemine head there is a Cupid, or a child resembling him, bestriding and bridling a lyon, which importeth that sufferance may curbe insolence, and innocence restraine violence, which alludeth to the great mercy of the King, whose type is a proper embleme of that

great majesty, whose mercy is above all his workes. On the bulkhead right forward stand six severall statues in sundry postures, their figures representing Consilium, that is Counsell; Cura, that is Care; Conamen, that is Industry; and unanimous endeavors in one compartement; Counsell holding in her hand a closed or folded scrole; Care a sea compasse, Conamen, or Industry, a luit stock fired. Upon the other, to correspond with the former; Vis, which implyeth Force, or Strength, handing a sword; Virtus, or virtue, a sphearicalle globe; and Victoria, or Victory, a wreath of lawrell. The moral is, that in all high enterprizes there ought to be first, Counsell to undertake, then Care to manage, and Industry to performe: and, in the next place, where there is ability and strength to oppose, and vertue to direct, Victory consequently is alwayes at hand ready to crowne the undertaking. Upon the hances of the waste are foure figures, with their several properties; Jupiter riding upon his eagle, with his trisulk, from which hee darteth thunder, in his hand; Mars, with his sword and target, a fox being his embleme; Neptune, with his sea horse, dolphin, and trident; and, lastly, Æolus upon a camelion, a beast that liveth onely by the ayre, with the foure windes his ministers or agents; the East called Eurus, Subsolanus, and Apliotes; the North winde, Septemtrio, Aquilo, or Boreas; the West, Zephyrus, Favorinus, Lybs and Africus; the South, Auster, or Notus. I come now to the sterne, where you may perceive upon the upright of the upper counter standeth Victory, in the middle of a frontispiece, with this general motto, *Validis incumbite remis.* It is so plaine, that I shall not need to give it any English interpretation. Her wings are equally display'd; on one arme she weareth a crowne, on the other a laurell, which imply Riches and Honour; in her two hands she holdeth two mottoes, her right hand which pointeth to Jason, beares this inscription, *Nava*; which word howsoever by some, and those not the least opinionated of themselves, mistaken, was absolutely extermin'd and excommunicated from a grammatical construction, nay, jurisdiction, for they would not allow it to be verbe or adverbe, substantive nor adjective; and for this, I have not only behind my back bin challenged, but even *viva voce* taxed as one that had writ at randum, and that which I understood not. But to give the world a plenary satisfaction, and that it was rather their criticisme than my ignorance, I entreate the reader but to examine Rider's last edition of his dictionary, corrected and greatly augmented by Mr. Francis Holyoke, and he shall there read, *navo, navas*; and therefore consequently *nava* in the imperative mood signifies a

command to imploy all one's power to act, to ayde, to helpe, to endeavor with all diligence and industry, and therefore not unproperly may Victory point to Jason, being figured with his oare in his hand, as being the prime Argonaut, and say, *nava*, or more plainely, *operam nava*; for in those emblematical mottoes there is alwayes a part understood. Shee pointeth to Hercules on the sinister side, with his club in his hand, with this motto, *Clava*, as if she would say, O Hercules, be thou as valiant with club upon the land as Jason is industrious with his oare upon the water. Hercules againe pointing to Æolus, the god of windes, saith, *Flato*, who answereth him againe, *Flo*. Jason pointing to Neptune, the god of the seas, riding upon a sea-horse, saith, *Faveto*, to whom Neptune answereth *No*. These words *Flo* and *No* were also much excepted at, as if there had been no such Latine words, till some examining their grammar rules, found out *Flo*, *Flas*, *Flari*, proper to Æolus, and *No*, *Nas*, *Nari*, to Neptune, etc.

In the lower counter of the sterne, on either side of the helme, is this inscription:—

Qui mare, qui fluctus, ventos navesque gubernat,
Sospitet hanc arcam Carole magne tuam.

Thus Englisht:

He who seas, windes, and navies doth protect,
Great Charles, thy great ship in her course direct.

There are other things in this vessel worthye remarke, at least, if not admiration; namely, that one tree or oake made foure of the principall beams of this great ship, which was forty foure foote of strong and serviceable timber in length, three foote diameter at the top, and ten foote diameter at the stubbe or bottome. Another as worthy of especiall observation is, that one peece of timber, which made the kelson, was so great and weighty, that twenty-eight oxen and foure horses with much difficulty drew it from the place where it grew, and from whence it was cut, downe unto the water side.

There is one thing above all these for the world to take especiall notice of, that shee is besides tunnage just so many tuns in burden as their have beene yeares since our blessed Saviour's incarnation, namely, 1637, and not one under or over. A most happy omen, which though it was not the first projected or intended, is now by true computation found so to happen. It would bee too tedious to insist upon every ornament belonging to this incomparable vessel, yet thus much

concerning her outward appearance. She hath two gallaries of a side, and all parts of the ship are carved also with trophies of artillery, and types of armour, as well belonging to land as sea, with symboles, emblemes, and impresses, appertaining to the art of navigation; as also, their two sacred Majesties' badges, of honour, armes, eschutcheons, etc, with severall angels holding their letters in compartements; all which workes are gilded quite over, and no other colour but gold and blacke to be seene about her; and thus much, in a succinct way, I have delivered unto you concerning her inward and outward decorements. I come now to describe her in her exact dimensions.

Her length by the keele is one hundred and twenty eight foote, or there-about, within some few inches. Her mayne breadth or wideneese from side to side forty eight foote. Her utmost length from the fore end of the sterne, *a prora ad puppim*, two hundred and thirty two foote. She is in height, from the bottome of her keele to the top of her lanthorne seventy-six foote. She beareth fire lanthornes, the biggest of which will hold ten persons to stand upright, and without shouldring or pressing one the other.

She hath three flush deckes and a fore-castle, an halfe deck, a quarter decke, and a round house. Her lower tyre hath thirty ports, which are to be furnished with demi-cannon and whole cannon throughout, being able to beare them. Her middle tyre hath also thirty ports for demi-culverin, and whole culverin. Her third tyre hath twentie sixe ports for other ordnance. Her forecastle hath twelve ports, and her halfe decke hath fourteene ports. She hath thirteene or fourteene ports more within board for murdering peeces, besides a great many loope holes out of the cabins for musket shot. She carrieth moreover ten peeces of chase ordnance in her right forward, and ten right aff, that is, according to land service, in the front and reare. She carrieth eleven anchors, one of them weighing foure thousand foure hundred, etc, and according to these are her cables, mastes, sayles, cordage, which, considered together, seeing Majesty is at this infinite charge, both for the honour of this nation and the security of his Kingdome, it should bee a great spur and encouragement to all his faithful and loving subjects to bee liberall and willing contributaries towards the ship money.

I come now to give you a particular denomination of the prime workemen imployed in this inimitable fabricke; as first, captayne Phineas Pett, overseer of the worke, and one of the principal officers of his Majestie's navy, whose ancestors, as father, grandfather, and great great grandfather, for the space of two hundred yeares and up-

wardes, have continued in the same name officers and architectures in the royall navy, of whose knowledge, experience, and judgement, I cannot render a merited character.

The maister builder is young Mr. Peter Pett, the most ingenious sonne of so much improved a father, who, before he was full five and twenty years of age, made the model, and since hath perfected the worke which hath won not only the approbation but admiration of all men, of whom I may truly say as Horace did of Argus, that famous ship-master, who built the great Argo, in which the Grecian princesse rowed through the Hellespont, to fetch the golden fleece from Colchos:

> Ad charum tritonia devolat Argum
> Maliri hanc puppim imbet.

That is, Pallas herselfe flew into his bosome, and not only injoyn'd him to the undertaking, but inspired him in the managing of so exquisite and absolute an architecture.

Let me not here forget a prime officer, master Francis Skelton, clerke of the checke, whose industry and care in looking to the workmen imploy'd in this structure, hath beene a great furtherance to expedite the businesse.

The master carvers are John and Mathias Christmas, the sonnes of that excellent workeman, master Girard Christmas, some two yeares since deceased, who, as they succeed him in his place, so they have striv'd to exceed him in his art, the worke better commending them than my pen is any way able, and I make no question, but all true artists can, by the view of the worke, give a present nomination of the workemen.

The master painters, master joyner, master calker, master smith, &c., all of them in their severall faculties being knowne to bee the prime workemen of the kingdom, more selectedly imploy'd in this service."

Of the manner of collecting and transporting the timber necessary for the building of this "prodigious great ship," we are informed by Mr. Pett himself in his diary.

"I, This day," (May 14th, 1635), he writes, "took leave of his Majesty at Greenwich, with his command to hasten into the north to provide and prepare the frame timber, plank and treenels, for the new ship to be built at Woolwich. I left my sons to see the moulds and other necessaries, shipped in a Newcastle ship, hired on purpose to transport our provisions and workmen to Newcastle. Attending the bishop of Durham, with my commissions and instructions, whom I

found wonderfully ready to assist us, with other Knights, gentlemen, and justices of the county, who took care to order present carriage, so that in a short time there was enough of the frame ready to lade a large collier, which was landed at Woolwich, and as fast as provisions could be got ready, they were shipped off from Chapley wood, at Newcastle, and that at Barnspeth park from Sutherland. The 21st of Dec. we laid the ship's keel in the dock, most part of her frame coming safe was landed at Woolwich. The 16th of January, his Majesty, with divers lords, came to Woolwich to see part of the frame and floor laid, and that time he gave orders to myself and my son to build two small pinnaces out of the great ship's waste. The 28th, his Majesty came again to Woolwich, with the Palgrave, his brother, Duke Robert, and divers other lords, to see the pinnaces launched, which were named the Greyhound and Roebuck."

To complete the account of the British Navy, up to the time of the first Dutch war, and to show how, in the opinion of an Englishman, its vessels and its men then compared with those of other navies, the following extract, from Fuller's Worthies of England, is as pertinent as it is amusing:

The Navy Royal.

It may be justly accounted a wonder of Art. And know, the ships are properly here handled, because the most, best, and biggest of them have their birth (built at Woolwich) and winter abode (nigh Chatham in the river of Medway) in this county. Indeed, before the reign of Queen Elizabeth, the ships royal were so few, they deserved not the name of a fleet; when our kings hired vessels from Hamborough, Lubeck, yea Genoa itself. But such who, instead of their own servants, use chairfolk in their houses, shall find their work worse done, and yet pay dearer for it.

Queen Elizabeth, sensible of this mischief, erected a Navy royal (continued and increased by her successors) of the best ships Europe ever beheld. Indeed, much is in the matter, the excellency of our English oak; more in the making, the cunning of our shipwrights; most in the manning, the courage of our seamen; and yet all to God's blessing, who so often hath crowned them with success.

If that man who hath *versatile ingenium* be thereby much advantaged for the working of his own fortune, our ships, so active to turn and wind at pleasure, must needs be more useful than the Spanish galleons, whose unweildiness fixeth them almost in one posture, and maketh them the steadier marks for their enemies.

As for Flemish bottoms, though they are finer built, yet as the slender barbe is not so fit to charge with, they are found not so useful in fight. The Great Sovereign, built at Woolwich, a lieger-ship for state, is the greatest ship our island ever saw. But great medals are made for some grand solemnity, whilst lesser coin are more current and passable in payment.

I am credibly informed, that that mystery of shipwrights, for some descents, hath been preserved successively in families, of whom the pets about Chatham are of singular regard. "Good success have they with their skill"; and carefully keep so precious a pearl, lest otherwise amongst many friends some foes attain unto it! It is no monopoly which concealeth that from common enemies, the concealing whereof is for the common good. May this mystery of ship-making in England never be lost, till this floating world be arrived at its own haven, the end and dissolution thereof!

I know what will be objected by foreigners, to take off the lustre navy royal, viz.; that, though the models of our great ships primitively were our own, yet we fetched the first mould and pattern of our frigates from the Dunkirks, when in the days of the Duke of Buckingham (then admiral) we took some frigates from them, two of which still survive in his majestie's navy, by the names of Providence and Expedition.

All this is confessed; and honest men may lawfully learn something from thieves for their own better defence. But, it is added, we have improved our patterns, and the transcript doth at this day exceed the original. Witness some of the swiftest Dunkirks and Ostenders, whose wings in a fair flight have failed them, overtaken by our frigates, and they still remain the monuments thereof in our navy.

Not to disgrace our neighboring nations, but vindicate ourselves, in these nine following particulars the navy royal exceeds all kingdoms and states in Europe;

1. Swift Sailing; which will appear by a comparative induction of all other nations.

First, for the Portugal, his *Caroils* and *Caracts*, whereof few now remain (the charges of maintaining them far exceeding the profit they bring in); they were the veriest drones on the sea, the rather because formerly their ceiling was dammed up with a certain kind of mortar to dead the shot, a fashion now by them disused.

The French (how dextrous soever in land battles) are left-handed in sea fights, whose best ships are of Dutch building.

The Dutch build their ships so floaty and buoyant, they have little hold in the water, in comparison of ours, which keep the better wind, and so outsail them.

The Spanish pride hath infected their ships with loftiness, which makes them but the fairer marks to our shot. Besides, the wind hath so much power of them in bad weather, so that it drives them two leagues for one of ours to the leeward, which is very dangerous upon a lee shore.

Indeed, the Turkish frigates, especially some thirty-six of Algiers, formed and built much near the English mode, and manned by renegadoes, many of them English, being already too nimble-heeled for the Dutch, may hereafter prove mischievous to us, if not seasonably prevented.

2. Strength.

I confine this only to the timber whereof they are made, our English oak being the best in the world. True it is (to our shame and sorrow be it written and read) the Dutch of late have built them some ships of English oak, which (through the negligence or coveteousness of some great ones) was bought here and transported hence. But the best is, that, as Bishop Latimer once said to one who had preached his sermon, that he had gotten his fiddlestick but not his rosin, so the Hollanders with our timber did not buy also our art of ship-building.

Now the ships of other countries are generally made of fir and other such slight wood; whereby it cometh to pass, that, as in the battle in the forest of Ephraim (wherein Absalom was slain), "the wood devoured more people that day than the sword;"* the splinters of so brittle timber kill more than the shot in a sea-fight.

3. Comeliness.

Our frigates are built so neat and snug, made long and low; so that (as the make of some women's bodies handsomely concealeth their pregnancy or great belly) their contrivance hideth their bigness without suspicion, the enemy not expecting thirty, when (to his cost) he hath found sixty pieces of ordnance in them. Our masts stand generally very upright; whereas those of the Spaniards hang over their poop as if they were ready to drop by the board; their decks are un-

* 2 Samuel xviii. 8.

equal, having many risings and fallings, whereas ours are even; their ports, some higher in a tier than others, ours drawn upon an equal line.

Their cables are bad (besides subject to rot in these countries), because bought at the second hand; whereas we make our best markets, fetching our cordage from the fountain thereof.

4. Force.

Besides the strength inherent in the structure (whereof before), this is accessary, consisting in the weight and number of their guns: those of the

Sixth	Rates carrying	10, 12, 14, 16, 18, 20,	Ordnance mounted.
Fifth		22, 26, 28, 30,	
Fourth		38, 40, 44, 48, 50,	
Third		50, 54, 56, 60,	
Second		60, 64, 70,	

The Royal Sovereign, being one of the first rates, when she is fitted for the seas, carrieth one hundred and four pieces of ordnance mounted.

5. Seamen.

Courageous and Skilful,—for the first, we remember the proverb of Solomon: "Let another praise thee, not thy own mouth, a stranger, not thy own lips."* The Spaniards with sad shrug, and Dutch with a sorrowful shaking of their heads, give a tacit assent hereunto.

Skilful.—Indeed navigation is much improved, especially since Saint Paul's time; insomuch that, when a man goes bunglingly about any work in a ship, I have heard our Englishmen say, "Such a man is one of St. Paul's mariners." For though, no doubt, they were as ingenious as any in that age to decline a tempest,† yet modern experience affords fairer fences against foul weather.

6. Advantageous Weapons.

Besides guns of all sorts and sizes, from the pistol to whole cannon, they have round-double-head-bur-spike-crow-bar-case-chain-shot. I join them together, because (though different instruments of death) they all concur in doing execution. If they be wind-ward of a ship, they have arrows made to shoot out of a bow, with fire works at the end, which if striking into the enemy's sails, will stick there, and fire

* Proverbs, xxvii. 2.

† Acts, xxvi.

them and the ship. If they lie board and board, they throw hand-grenades with stink-pots into the ship; which make so noisome a smell that the enemy is forced to thrust their heads out of the ports for air.

7. Provisions.

1. Wholesome; our English beef and pork, keeping sweet and sound longer than any flesh of other countries, even twenty-six months, to the East and West Indies.

2. More plentiful than any prince or State in all Europe alloweth; the seamen having two beef, two pork, and three fish days. Besides, every seaman is always well stored with hooks to catch fish, with which our seas do abound; insomuch that many times six will diet on four men's allowance, and so save the rest therewith to buy fresh meat, when landing where it may be procured. I speak not this that hereafter their allowance from the king should be less, but that their loyalty to him, and thankfulness to God, may be the more.

8. Accommodation.

Every one of his majesty's ships and frigate officers have a distinct cabin for themselves; for which the Dutch, French and Portuguese do envy them, who for the most part lie *sub dio* under decks.

9. Government.

Few offences comparatively to other fleets are therein committed, and fewer escape punishment. The offender, if the fault be small, is tried by a Court-martial, consisting of the officers of the ship; if great, by a council of war, wherein only commanders and the judge-advocate. If any sleep in their watches, it is pain of death. After eight o'clock none, save the captain, lieutenant, and master, may presume to burn a candle. No smoking of tobacco (save for the privilege aforesaid) at any time, but in one particular place of the ship, and that over a tub of water. Preaching they have lately had twice a week; praying twice a day; but my intelligencer could never hear that the Lord's Supper for some years was administered aboard of any ship, an omission which I hope hereafter will be amended.

But never did this navy appear more triumphant, than when in May last it brought over our gracious sovereign, being almost becalmed (such the fear of the winds to offend with over roughness); the prognostic of his majesty's peaceable reign.

THE FAREWELL.

Being to take our leave of these our wooden walls; first, I wish that they may conquer with their mast and sails, without their guns; that their very appearance may fright their foes into submission.

But if, in point of honour or safety, they be necessitated to engage, may they always keep the wind of the enemy, that their shot may fly with the greater force, and that the smoke of their powder, pursuing the foe, may drive him to fire at hazard! May their gunner be in all places of the ship, to see where he can make a shot with the best advantage; their carpenter and his crew be always in the hold, presently to drive in a wooden plug (whereas a shot comes betwixt wind and water), and to clap a board with tar and camel's hair upon it till the dispute be over; their chirurgeon and his assistants be in the same place (out of danger of shot) to dress the wounded; their captain be in the uppermost, the lieutenant in every part of the ship, to encourage the seamen; the chaplain at his devotions, to importune heaven for success, and encouraging all by his good council, if time will permit!

The reader having now been made acquainted with the English navy, it becomes necessary, in order that he may have a proper understanding of the battles which it fought with the navy of the united Provinces, to trace the rise and progress of the latter, up to the moment of actual conflict, and to touch briefly upon the history of that remarkable people, whose self-reliant, fearless, independent, and energetic character enabled their country to carry on, to a successful issue, an eighty years' war with Spain, and to compete, for so long a period, with its great maritime rival, for supremacy at sea.

Holland or Ollant, as the earliest Dutch writers styled the land they inhabited, is said to mean marshy ground, "which," remarks Bosworth, "exactly suits the fenny and boggy soil it designates. Look for the word in the Teuthonista of Van der Schueren, and you will find *'Beven daveren als eyn ollant, scatere'*—tremble under the feet as a marshy ground." Pliny mentions it as "a county over which the ocean pours in its flood twice every day, and produces a perpetual uncertainty, among its inhabitants, whether they are living upon the land or at sea," while English seamen were wont to speak of it, contemptuously, as "a bit of mud carried over from the Channel on the leads of British pilots."

Its first inhabitants, so far as we know, were the Batavians, whom Tacitus characterizes as the bravest and most warlike of the Germans, and it is from this tribe that Grotius, Erasmus, and others of the most

learned Dutch authors claim the Dutch of the 17th century to be descended; but as the historian Wagenaar asserts positively that the Batavians had become so exhausted in Rome's wars that in the 5th century their very name became obliterated from history, how, it may be pertinently asked, could there be any of their blood remaining among the inhabitants of their country, twelve hundred years later? Batavia, overrun by horde after horde of fierce barbarians, fell finally into the hands of the Friezlanders, a people resembling its primitive inhabitants in every respect. Among their virtues not the least was the tenacity with which they clung to ancient friendships, perferring old friends to new even for companionship in the world to come. Wilfran, Archbishop of Sens under Charles Mastel, after much persuasion, believed he had prevailed upon king Radbod of Friezland to be baptized. The king, indeed, had gone so far as to place one foot upon the font when he asked—"Are my ancestors among the blessed in heaven?" "Assuredly not," replied the good bishop, "they are damned"—"I will not, then," exclaimed Radbod starting back, "forsake my many friends in hell, to dwell with a few Christians in Heaven." *

In the 10th century, a part of ancient Batavia, under the distinctive name of Holland, organized a separate government for itself, of which Diedrick was made the head, with the title of Count of Holland, (A. D. 903); Philip the 2nd of Spain being the last who was raised to this dignity in 1581. Philip, being a bigoted Catholic and infringing the rights of Holland and the neighboring States, Holland united with four of them in 1579, and with two others in 1581, to resist Spanish tyranny. This confederation formed the seven united Provinces of Holland. Friezland, Utrecht, Gueldres, Zutphen, Overyssell and Groningen, whose inhabitants, accustomed to struggle with the very ocean itself for the soil they inhabited, were not disposed to submit tamely to encroachments from other quarters. With admirable independence, considering the age in which they lived, they declared, in their manifesto, that "the prince is made for the people, not the people for the prince," and that "the prince who treats his subjects as slaves is a tyrant whom his subjects have a right to dethrone."

The Federal Government was composed of a States General to which all the States sent their representatives, a Stadtholder who was Captain General and Admiral and had the appointment of all military and naval commissions, a Treasurer, a Conservator of the Peace, and

* Dans. History of Holland.

a Grand Pensionary; but, as the three last named officers were entirely independent of the first, while all held their offices at the will of the States General, which could neither make war nor peace if a single province objected thereto, it is clear that the people of the united Provinces were themselves the source and end of all power.

In 1650, the office of Stadtholder was discontinued; but, revived in 1654, by decree of the States General, and conferred on the Prince of Orange as an hereditary rank.

As might have been expected from their position, the Netherlanders applied themselves, at a very early period, to marine pursuits, and especially to fishing, which in the end became a source of such immense national wealth to their country that the discovery of an improved method of drying and barrelling herrings, in 1414, gained for its author, Jacob Benkelson, the everlasting gratitude of his countrymen; the great Charles the 5th, on one of his many journeys, stopping to visit the monument erected to his memory, because he regarded him "as one of the greatest benefactors of mankind."

By degrees, their voyages were extended, from the fishing banks on their own and the English coast, to the countries bordering on the Atlantic Ocean and the Baltic and Mediterranean seas, and finally, to the remotest corners of the habitable globe; their ships increasing in size as the ports which they were required to visit became more distant. Their vessels differed from those of other nations in their having more beam in proportion to their length and in their flatter floors, the sands which environ their coast obliging them to make them of as light draught as possible; and "this principle acting forcibly on the minds of an economical people, that the greater the breadth which is given to a vessel the less will be the expense in constructing it, proportioned to the commodities that it will be able to contain."

So advanced were the ideas of the Dutch, as regards commercial enterprise, that they held it as good policy for a nation to supply even its enemies with munitions of war, since if not so supplied, they would obtain them from another source, "while an enemy's gold" they argued, "passed as readily as a friend's."

In 1638, a merchant of Amsterdam, named Beyland, upon being dragged before the magistrates of that city on a charge of having violated the neutrality of his country by carrying powder and muskets to Antwerp, then besieged by the Spaniards, boldly admitted the accusation, declaring that the people of Amsterdam had a right to trade where they pleased, and that "for his part he would risk burning his

sails on a voyage to hell, if anything could be made by bringing brimstone therefrom."

The magistrates with one accord approved of his course and ordered that he should be discharged from custody. Such, in brief, were the condition and temper of the merchants and the merchant marine.

In 1589, the navy of The United Provinces, which previously to this period had been, like that of England before the time of Henry the Seventh, a mere assemblage of armed merchantmen, was placed upon a regular footing. A Board of Admiralty was created, consisting of seven members, of which the Admiral-in-chief was the head, who remained in office for three years. Their duties were to build and fit ships, to supply them with cannon and other munitions of war, and to see that their crews were provided with good clothing and provisions and regularly paid. Their navy, under this system, gradually increased until it consisted of about one hundred large vessels, for coast defense, and some sixty or seventy yachts and pinnaces of eighty or less tons each, to protect their rivers and inland seas.

In 1602, the Dutch East India Company was formed, which, with its large capital and fine ships, well manned and armed, added greatly to the naval resources of the country.

But the great strength of the Navy consisted in this, that it was founded upon the affections of the people, and kept alive by their traditions, there being scarcely a family in the whole United Provinces without one or more representatives in it; so that its services and its heroism became the themes of every fireside, the old men telling of the storms they or their comrades had weathered and the battles they had taken part in, and the young men listening with attentive ears to the recital, anxious to emulate the deeds of their sires.

Thus on some evenings the story would be told of Piet Hein's doings at San Salvador, and of his capture of the Silver Fleet—on others of the patriotism of rear-admiral Klaaszoon, who, being surrounded by a Spanish fleet, defended his vessel until his masts were gone, his ammunition exhausted, and every man of his crew either killed or desperately wounded, when he proposed to the survivors to blow up the vessel that none might fall alive into the enemy's hands; and we may imagine the effect upon young and old as the narrators would go on to describe the scene that followed *. The rear-admiral, kneeling down in the midst of his officers and men, and with hands clasped and eyes

* Cerisier, Tome, iv. p. 541.

uplifted to Heaven asking pardon for his and their sins, and invoking a blessing upon his country; and then coolly setting fire to the train leading to the magazine, and yielding up his life here for immortality hereafter.

But the story which was oftenest told and most eagerly looked for was that of the destruction of a Spanish fleet at Gibraltar by the gallant Heemskerk; for it was a tale of valor unsurpassed in naval annals, and of peculiar interest to the Dutch people as the first great triumph of their navy over that arrogant foe, under whose ruthless tyranny their land had, for almost a hundred years, groaned. The facts are these:

In the latter part of the 16th century, the loss to Dutch shipping by the depredations of Spanish cruisers was so great as seriously to alarm the merchants of the United Provinces, lest it should be actually swept from the ocean. In this emergency, the States General resolved to fit out a fleet expressly to cruise against Spanish commerce, and "to assail the Spaniards at sea and on land."

For this purpose, in 1607, a force of twenty-six of their largest and best vessels was collected, armed with cannon of the heaviest calibre, and provided with every thing necessary for its efficiency that gold could procure. Its officers and crews were picked men and, by unanimous consent, the command-in-chief was conferred upon Jacob Van Heemskerk, a man of exalted courage and singular modesty, who had made two voyages to the Arctic Ocean, and commanded the fleet of the East India Company, in a successful engagement with the Spaniards, in 1604.

On the 25th of March, the armament set sail, and on the 24th of April, while running along the Spanish coast, the admiral was informed by a Frenchman that he had seen twenty-one Spanish men-of-war in the straits of Gibraltar standing in for the town. This was just the opportunity Heemskerk wanted; so he assembled his captains on board his flag-ship, the Æolus, and explained to them his plan of battle, and, after they had returned to their commands, made all sail with a leading wind for the straits, which he reached early on the following morning.

As he approached Gibraltar, the Spanish fleet was observed to be anchored in a semi-circle off the quay, which was of stone, and bristling with cannon, while the wings of the fleet were protected by castles strongly garrisoned, whose guns frowned defiance toward the sea.

The admiral had been standing on deck for several long hours, anxiously waiting to catch a glimpse of the foe. He was dressed in full uniform and wore a helmet on his head. "There they are", said he, pointing out the Spaniards to his flag-captain, the gallant Verheoff—"nine galleons and twelve smaller vessels. Their crews already outnumber ours two to one, and yet soldiers are being carried off to them by boatloads; but we will give them a sound drubbing, nevertheless." His commanders now came on board to receive his last orders, and, having drunk a glass of wine together, vowed to stand by each other and their admiral to the death. "Comrades," said the admiral in reply, "you have now an opportunity of winning the gratitude of your country and the admiration of mankind. Do your whole duty then and follow me; I shall be foremost in the fight." He then shook hands with them all round, and they left the ships.*

The Æolus now took the lead, with the wind a little forward of the port beam, followed by the other vessels in close order, all with every rag of canvas set, and steered for the Spanish Admiral's ship, which was a little apart from and to seaward of the leemost vessel of the enemy's line.

As the Dutch came toward him in this dashing style, the Spanish admiral, Don Juan Alvarez d'Avila, who was standing on the quarter deck of his magnificent flag-ship, the St. Augustine, carrying seven hundred officers and men, sent for the master of a Rotterdam vessel who was a prisoner on board, and asked him what he presumed to be Heemskerk's intention. "He intends to attack you, I think," replied the skipper curtly.

Alvarez was a brave man who had done his duty gallantly at Lepanto, and, as he glanced at the bronzed faces of his seamen and felt the strength of his position, he laughed a scornful laugh—"Why a single squadron of my fleet, covered as we are by the shore batteries, would be more than a match for your countrymen", said he, "even if they were led by the Cid. Surely their admiral cannot be mad enough to engage us."

"We shall soon know," admiral, was the quiet response; "but see they are at prayers, as is the custom in our Navy before joining battle."

The ships were so near now that Alvarez could see what was passing on their decks, where he noted with astonishment that all hands were kneeling. In a few minutes, however, the Dutchmen rose to their feet,

* Cerisier, Tome iv, p. 544.

and after taking a "farewell draught" from an immense bowl which one of their number passed around, went to their quarters and commenced shotting their guns. Then D' Avila comprehended that they were really in earnest, and, not wishing to be surrounded, he cut his cable and made sail toward the town, coming to anchor again just inside of his vice-admiral.

"Shall we engage the vice-admiral, sir?" asked the captain of the Eolus of his superior.

"No" replied Heemskerk sternly, "nor waste a shot on him as you pass; reserve your whole fire until we get alongside of the admiral and our anchor is gone. Two hundred gilders for the man who brings down his flag." So onward he went, leaving the vice-admiral on his left and bearing up a little to get on the St. Augustine's starboard side, while Captain Lambert Hendrickson of Rotterdam, in the Black Bear, ranged upon her port quarter, the other vessels keeping their course, and *doubling* on the enemy, as they reached his column, so that every Spanish ship engaged found herself at close quarters with two antagonists.

But, as the Eolus was rounding the stern of the San Augustine and taking in her canvass, the Spaniard opened upon her with his stern chasers, keeping up a brisk fire with his starboard guns as they were brought to bear, and, at the same time, manning his port battery, in readiness to discharge a broadside at the Black Bear.

Yet Verheoff, in strict obedience to his orders, made no reply until he had got his berth and his anchor was let go, when, in a loud voice, heard from one end of the ship to the other, he cried, "Now, boys, let them have it—Fire."

The vessel was still quivering from the recoil of her guns, when a ball from the San Augustine came crashing through her after bulwarks, throwing splinters in all directions, one of which, striking Heemskerk's left leg, so crushed it, that the broken bones protruded from the skin in several places, and he fell, bathed in blood, to the deck. Verheoff ran to him, and, stooping over him, endeavored to raise him in his arms. But the dying man, amid all his agony, was true to himself and his country—"Let me remain where I am", he whispered; "give all your thoughts to your ship—victory is certain—keep my flag flying until the battle is won." Then, seizing his faithful friend's hand, he pressed it to his heart, and expired.

The Dutch ships by this time had all reached their position, and the battle was raging everywhere from the centre of the Spanish fleet to its

extreme rear, while the vessels of the Spanish van, having cut their cables, were hastening to their friends' relief, some being already before the wind, and others still wearing under their jibs. As they sailed down inshore of the combatants, they poured broadside after broadside into the Starboard Dutch column, whose twelve vessels suffered fearfully from the cannonade: but when, upon gaining their berths, they anchored, and, swinging round, some with their bows and some with their sterns toward the foe, exposed themselves to a raking fire, the Dutch opened upon them with such effect that two of their number, with their masts over their sides and their cables absolutely cut in twain, drifted ashore, while one of them, a huge galleon, blew up, and several were set on fire.

The Dutch meanwhile had not escaped unscathed; but were riddled with shot from stem to stern, and many of them took fire from the burning Spanish ships with which they or their consorts had been engaged, finding it impossible to avoid them as they drifted alongside.

The Groningen, after whipping two Spanish ships, had laid herself alongside of a third, when her foremast went by the board, and her captain fell dead upon the deck.

Finding themselves thus deprived of their commander, the crew gave up all as lost and flinched from their guns. At this critical instant, the cabin door flew open and a flaxen haired boy of about ten years of age rushed upon deck, and, throwing his arms around the neck of the corpse, covered its pale face with kisses. Then, springing to his feet, he ran to the crew and with flashing eyes, although his cheeks were still wet with tears, called upon them to avenge his father's death.

The cheer that arose in response to this appeal was heard above the din of battle throughout the fleet, and the next instant the Groningen's men, headed by their remaining officers, were on the deck of the Spaniard, and driving their enemies before them, some below and some over the high bulwarks into the sea.

So the fight continued until near sunset, ceasing only with the utter destruction of the Spaniards, while not one single Dutch ship was destroyed or fell into the enemy's hands.

The gallant D'Avila was killed, and of his officers and men so many were slain that "their bodies floated about the bay in countless numbers until the following day."

As the Dutch ships, after their work of death, stood slowly out of Gibraltar bay, their men manned the rigging and filled the air with their cheers, for as yet, outside of Verheoff's vessel, none knew that

their great admiral was killed; but when his flag and the ensign of the Eolus, lowered to half-mast, gave notice of the fact, a feeling of gloom overspread the whole fleet; for each man felt that he had lost a friend, while all regarded his death as a national calamity. His body was carried to Amsterdam and buried in the Oude Kerk, where the marble monument erected to his memory is still pointed out by his countrymen. An inscription on it, by the poet Hooft, records his virtues and his heroism.

With such teachings, it is not surprising that every adventurous boy in the Provinces took to the sea as naturally as a sea-gull, nor that the Dutch navy soon acquired an enviable reputation throughout the world. Although the Spaniards had done their utmost to cripple it, it seemed to grow stronger under their blows, until in 1639, Philip the Fourth, of Spain, undeterred by the fate of the Invincible Armada, sent against it the whole sea force of his kingdom, in a last grand effort to destroy it, and to regain (so rumor had it)* the sovereignty of the lands lost through his grandfather's bigotry.

This armament, which consisted of sixty-seven large vessels,† carrying, in the aggregate, two thousand guns and twenty-five thousand men was commanded by Don Antonio de Oquendo, an officer of great repute in the Spanish service, and a relative of the famous Miguel de Oquendo, "the Philip Sydney of Spain," who, upon being asked by the Duke of Medina Sidonia for his advice, when the Invincible Armada seemed to be drifting upon the dangerous shoals off the coast of Holland, replied with spirit: "Seek counsel of Diego Florez, your excellency. All I ask is to be kept well supplied with powder and ball".‡

Leaving Corunna in the latter part of August and steering for the British channel, this formidable armament reached Cape Grisney on the 15th of September, where it found, awaiting its arrival, a Dutch Squadron of observation, dispatched by the Prince of Orange, on information from the Court of France, of Philip's designs—a force weak

* Rumor was as false on this occasion as it usually is, since the commander-in-chief of the armada, as we shall presently see, had orders to avoid the Dutch fleet altogether.

† This is the Dutch account, corroborated by the English. The Spanish historians say sixty vessels and twenty thousand men. The discrepancy probably arises from the fact that a squadron of Dunkirk vessels joined the Spaniards after they sailed from Spain.

‡ Digalo Diego Florez—Mandè me vuestra excelencia a municionas de balas.

in the number of its vessels (only thirteen all told), but strong in the character of its seamen, and especially so in its commander-in-chief, the fair-haired-boy, now grown to middle age, whose heroic conduct on board the Groningen had saved that vessel, as we have seen, from falling into the enemy's hands. This was the famous Marten Harperts Tromp.

When Tromp sighted the Spaniards, he sent orders to Admirals De Witte and Bankert, who were cruising between Dunkirk and Dover, to join him with their commands without delay, and then bore away, with flowing sheets, up the channel, firing guns every half hour, to apprise all Dutch craft that might chance to be within hearing, of the approach of the foe.

Early on the morning of the 16th, DeWitte, who had heard the signal guns, hove in view, with five large ships, and, in obedience to instructions, he was soon on board the admiral's ship, the Brederode, where the captains of the fleet, summoned by signal, were also fast assembling.

When all were met, Tromp invited each one to give his views as to what was best to be done, beginning with the junior captain; and, as usual in Councils of war, the opinions were conflicting, until it came to the turn of De Witte to speak, who so vehemently urged an immediate attack that he carried with him the whole Council—all but the Admiral, who shook his head disapprovingly as he looked toward the Spaniards, and, pointing out to his officers the disparity in size and in armament of the fleets, reminded them that, if they should be defeated, there would be nothing between Oquendo and their Fatherland but Bankert's small force of twelve vessels!

De Witte however—a man of dull perceptions, but of great animal courage, who could see no duty before him, when the enemy was in sight, but to engage—still adhered to his opinion that it would be best to attack at once; and at last Tromp consented, when all took a glass of wine together, and the Council broke up.

All this time the two fleets were running along the coast of France, with the wind off the land, on their starboard beam, the Dutch being some five miles in advance; but, upon a signal from their flag-ship, the latter wore in succession and stood for the enemy, Tromp beginning the action by pouring a broadside into the Spanish admiral, while De-Witte, sailing recklessly into the midst of the Armada, became engaged with four of its largest galleons.

For some hours the battle was very hot, and, when it ended (at about 4 P. M.), De Witte's ship had been fearfully cut up in masts,

rigging, and hull, and one of the largest of the Dutch vessels, the Saint Christopher, blown up; but the Spaniards had suffered even more, and they bore up for the English coast, with the Dutch hanging on their heels.

On the night of the 18th, Tromp succeeded in concentrating his whole force on the rear Spanish division, subjecting it to a terrific cannonade, and, at the dawn of day, on the 19th, Bankert was descried approaching with twelve fresh ships, whereupon Oquendo made all sail for neutral waters, coming to anchor in the Downs, under cover of Deal castles.

The Spanish admiral could scarcely have committed a greater blunder, since the anchorage he had chosen did not afford room for the deployment of half his large force, while, of its two entrances, the Southern entrance was but two miles wide and the Northern one so extremely narrow as not to admit of the passage through it, of more than one vessel at a time.

So soon as he found himself in this trap, Oquendo should have availed himself of the first fair wind to force the Southern channel, but he did nothing of the kind; and Tromp, quick to take advantage of an enemy's errors, lost no time in communicating to The States General the condition of affairs, and urging upon its members, collectively and individually, not only in written communications, but orally, through the lips of his intimate personal friends, the wisdom of sending to him without delay every available ship and man in The Seven United Provinces, that "he might at one blow make a complete finish of the Spaniards." And nobly did the States respond to his earnest solicitations; for, day by day, and hour by hour, during the space of almost a month, fresh ships reported to him; the British channel, the while, from the Goodwin Sands to the coast of Holland, being alive with transports bringing men, provisions, and arms. On a stormy night, towards the end of September, twelve Dunkirk ships, carrying four thousand men, and piloted by British fishermen, got away "through the Swash channel, round by the North Sand Head"; but Tromp quickly closed that avenue of escape, and gradually, as his force increased, drew nearer to the Spaniards, until, by the 17th of October, he had them completely hemmed in, his fleet (then consisting of one hundred and ten vessels) coming to anchor in the Downs, outside of them, confident of an easy victory if the enemy could but be brought to an engagement; to do which without having to fight the English fleet as well became now his great aim, since "Sir John Pennington, his

majesty's admiral, who lay in the Downs with thirty four-men of war, had informed him that he had received orders to act in defence of either of the parties which should be first attacked."

In pursuance of his object, Tromp got into his barge, on the morning of the 19th of October, and deliberately sailed through the Spanish fleet, as if making a reconnoissance of its numbers, strength and position; a proceeding which (as he must have foreseen) so stirred up the irascible Spaniards, that one of their vessels fired at him, sending a ball just over his head, and through the boat's sail. The next day he repeated the experiment with better success; his boat being again fired upon, and one of her crew killed outright.

The opportunity he had been longing for had come at last, and the man of action was resolved to take instant advantage of it—a resolve which he was confirmed in by advices received from The States General, directing him to engage the enemy at all hazards, even though he should be obliged to fight England to boot. He now called a council of war, and arranged his plan of battle, and at the same time sent the bloody corpse of the slain bargeman alongside the English flag-ship, "that Pennington might see for himself that Oquendo had been the first to violate the rights of asylum granted by the King of Great Britain to all nations seeking shelter on his coasts." The body was accompanied by a letter, wherein Tromp informed the British Admiral that he fully expected him to call the Spaniards to account for violating England's neutrality, and that if he failed to do so, he (Tromp) would take the matter into his own hands.

On the morrow, at dawn of day, the Brederode fired a gun as a signal to the Dutch fleet (which was riding at single anchor) to commence heaving in. A second gun followed about sunrise, when the topsails were let fall from their yards, which had been previously mastheaded, and the head sails hoisted.

The Dutch fleet then stood for the Spaniards in five divisions, leaving a sixth division, under De Witte, to watch the English, in readiness to engage them should they venture to take sides with the enemy. De Witte's force consisted, according to Le Clerc, of twenty-eight, frigates and four fire-ships.

No sooner were the Dutch underway than the Spaniards cut their cables, and endeavored to get to sea, by the passage between the Goodwins and the South Foreland; and, as if to favor them in their design, a thick mist, which completely concealed them from the enemy's view, came driving from the land. It was but of brief duration,

however, and when it lifted, twenty-two of the Spanish vessels, which had ventured too near the coast, were observed to be hard and fast aground, "one of which was a great galleon (the vice-admiral of Galicia) commanded by Don Antonia de Castro and mounted with fifty-two brass guns." Upon these vessels the fire of the whole Dutch fleet was concentrated, until their officers and men were forced to abandon them—some leaving in boats and others jumping overboard and swimming for the shore—when a number of fire-ships were sent against them, and seventeen of their number destroyed.

The other vessels of the Spanish fleet succeeded in reaching the open sea; but were soon overtaken by the Dutch, and forced into a fight which ended in their almost utter annihilation. The accounts are conflicting; but the Count D'Estrades characterizes the victory of the Dutch as the most complete ever seen (la plus complete, qui se soit jamais vue) while the Spanish historian, La Fuente, deplores, in pathetic terms, the total defeat sustained by his countrymen. "The greater part of our fleet," he writes, "was either captured, burnt or sunk, including the ship of the line, the Santa Teresa, of eighty guns, commanded by the famous Don Lope de Hoces, in which was embarked the most select regiment of musketeers to be found in all Spain. Of this regiment not one man was saved. But why enter into details? The truth is we lost, in that action, the best of our *navy* in seamen—of whom eight thousand perished—as well as in ships, and that our maritime power suffered this crushing blow more, to add to the naval disasters of the two previous reigns."

Only seven Spanish vessels, of which one bore the flag of the admiral-in-chief, succeeded in making their escape into the friendly harbor of Dunkirk. Sixteen fell into the hands of the Dutch, together with four thousand five hundred men, including officers, soldiers, and seamen. The Dutch loss in ships was ten, of which there was not one but went down or burned up with its colors flying. Their killed, wounded, and missing numbered less than one thousand.

Such was the fate of the second Armada dispatched by Spain to the British channel, which, like the first, was governed entirely from Madrid; for Oquendo had strict orders from the Spanish Cabinet, not to fight the Dutch, but to take refuge in English waters, and thence to send, as best he could, the twelve thousand infantry embarked on his vessels, to some port in Flanders. This explains fully the otherwise unaccountable behavior of one who was esteemed by his countrymen the very best seaman of his day; and his dire defeat adds anoth-

er to the long list of battles lost through the interference of meddlesome politicians with the management, tactics, and strategy of commanders-in-chief. Yet, although Don Antonia de Oquendo was doubtless a good officer, the world will not be willing to accept him as a great one; for a great man in supreme command, whether by sea or by land, will never regard instructions, no matter whence they emanate, which, if rigidly carried out, must lead to the destruction of his fleet or army, the humiliation of his nation's flag, or the loss of his own or his country's honor.

The Spaniards complained bitterly that the English had behaved, on this occasion, more like enemies than neutrals, (*mas como enemigos que como neutrales*) and that they had set fire to many of their ships; and Campbell * admits that "the people of England were not sorry for this misfortune which befel the Spaniards, and the reason of this was that some surmised this to be a new Spanish Armada, fitted out nominally against the Dutch, but in reality intended to act against heretics in general." (5) He asserts positively, however, that the Court took "all the care imaginable" to preserve England's neutrality, and he is corroborated in this by Le Clerc, who says the castles at Deal "fired upon some of the Dutch vessels which approached too near the shore."

The truth is the Dutch were fully determined to attack the Spaniards, come what might, and the English were not in sufficient force to prevent their doing so.

A century and a half before this time, the expulsion of the Moors from Granada and the discovery of America had placed Spain in advance of all other military and naval powers on the globe. The thoughts of her people, which for seven hundred years had been bent upon schemes for the recovery of every inch of their beloved soil from Moorish dominion, were, now that this task was accomplished and a new field of adventure opened to them, turned into an entirely new channel. At first the idea which fired the Spanish heart was the conversion of the heathen, and the addition of vast territories to the mother land; and each Spanish vessel that ploughed the main, bound to the New World, carried among her crew a host of doughty cavaliers whose names were already inscribed on the roll of fame, headed by some pious friar who was destined, on countless battle fields, to carry his crucifix side by side with the banner of Castile: but as carrack, pin-

* Lives of the British Admirals.

nace, and caravel returned to Spain, bringing marvellous accounts of the *El Dorados* of the West, the cupidity of the Spaniard became aroused, and avarice usurped in his breast the place of the nobler passions; so that the waters encompassing the earth were everywhere white with the sails of Spanish ships in quest of gold, until it might almost be said that, braving all dangers and committing all crimes, in the unhallowed pursuit, Spain itself had gone to sea. Spain's fame as a naval power now (6) reached the four quarters of the globe, and, increasing with each decade, culminated in 1571 with the battle of Lepanto. From that epoch the prestige of the Spanish navy declined; yet, terribly lowered as it was by the failure of the Invincible Armada, it was not entirely lost—for men attributed the disastrous issue of that expedition to divine, not human agency—until, at the hands of the Dutch, on the 21st of October, 1639, it received its finishing blow. The prayers of the oppressed of two continents had reached the throne of the Almighty at last; and it might well be believed that an avenging God had decreed that in "the battle of the Downs the sin of the Spaniard should weigh heavily on his head, and the prophecy of Charles de la Croye meet with its complete fulfilment. "Mark you," whispered he to the Duke of Alva, whom he found at Antwerp gazing upon a brazen figure of himself, trampling upon the effigy of a man with two heads, (symbols of the noble and the plebeian of Holland,) "Mark you, these heads, grinning so horribly, will some day rise again, to take signal vengeance upon those who are now spurning them with their feet."

But, now that the Dutch had become a maritime power, their neighbors across the channel, who claimed "to rule the waves", became exceedingly jealous of them, while they, on the other hand, elated with their recent successes, chafed under England's assumption of superiority, and especially under her demand that "every Dutch ship should lower her flag and topsails to the ships of the kings of England in the British seas." The unreasonableness of this demand was very ably set forth, in 1608, by the learned Grotius, in his *mare liberum*—a tract to which, it may be remarked, Selden's *mare clausum* was but a feeble rejoinder—yet the English Government steadily adhered to it, and, as if to add to its offensiveness, accompanied it with a declaration that "the British waters extended from the Naze of Norway to Cape Finisterre at the north-western extremity of Portugal." This occasioned frequent collisions between the Dutch and English on their own coasts, while in the East Indies their vessels seldom met without coming to an engage-

ment. Nor were their contentions confined to the sea alone. On land many a bloody scene was enacted; but the tragedy at Ambayna,—which from the ill feeling it stirred up in English breasts, was undoubtedly one of the exciting causes (7) of the wars between England and the United Provinces,—alone can claim a place in this history; and, in order that the reader may form an unbiassed judgment of it, I shall give both versions of the story. The English account is that, in 1619, a treaty was made between Great Britain and the United Provinces, wherein it was stipulated that, to avoid further disputes, the Dutch should enjoy two thirds of the trade of Ambayna and the English one third. In pursuance of this the English erected a factory in the island while the Dutch built a strong fort there.

In 1623, however, the Dutch, desiring to monopolize the spice trade, pretended that the English had formed a conspiracy with certain Japanese to capture the fort, and thereupon seized upon them all, and "without having other witnesses than themselves present," put them to horrible tortures, for the purpose of forcing them to avow that which they were determined they should avow. These tortures were as fearful as those of the Inquisition: the breasts of some of the accused "being filled with air until they were almost strangled, and their eyes ready to pop out of their heads, and the sides of others pierced with bars of red-hot iron which penetrated even to their entrails; others again had the soles of their feet burned with lighted candles." Having in this way extorted a confession from the sufferers, which they forced them to sign, they cut off the heads of ten of them (who with their latest breath asserted their innocence) and, "under a specious show of clemency," discharged the rest.

The absurdity of the charge made against their countrymen, say the English, is shown by the fact that, while they and the Japanese combined did not constitute a force of over fifty men, the Dutch had two hundred soldiers in their fort, and eight stout ships riding in the harbor; and that, even if they had had the foolhardiness to attempt such an act, they would have been deterred from it, from their certain knowledge that its consummation must bring upon them "eternal infamy and the loss of all their goods, since their sovereign, who hated to the last degree a violation of faith, had consented that the Dutch should hold the island and build a fort on it." Furthermore they declare that the subsequent conduct of the Dutch, in seizing not only upon the factory at Ambayna, but of every other English factory in the spice islands, too clearly demonstrates that their intent, from the

beginning, was to get the whole spice trade into their hands; and that avarice alone led to the accusation against the English, and all the enormities that followed it.

On the other hand the Dutch allege that their countrymen of Ambayna had for some time observed that the Indians of the neighboring islands were carrying on a secret correspondence with each other, contrary to the promise they had given, and without informing a single officer of the Dutch East India Company of their action. That, finally, they had become so bold as to threaten to attack the Dutch and pillage their factories, and that many of them had been heard to declare that the fort at Ambayna would not be much longer in Dutch hands. This induced the Governor of Ambayna to proceed to Loehoe, with a number of armed shallops, for the purpose of overawing the nations and bringing them into subjection; but when he arrived there he found them with a fleet of boats, more powerful than his own, drawn up in battle array; and, far from giving him satisfaction for the insults offered to his people, they endeavored to provoke him to attack them, and, finally, forced him to retreat to Ambayna without effecting anything.

This boldness of theirs caused the Dutch to suspect that a plot was forming for their overthrow in the East, and that some European nation was at the bottom of it. Close observation convinced them that the Indians of Loehoe, Cambello, and other places, were entirely under the influence of the English: and, continuing their investigations with great secrecy, they learned, in February, 1623, from a Japanese who was concerned in the intrigue, that a conspiracy had been formed against the fort of Ambayna and against the whole Dutch establishment on that island. He named Captain Towerson, the head of the English factory, and Abel Prys, an English surgeon, as the prime movers in the affair, in which all the English were concerned, and declared that the fort was to be carried through the treachery of thirty Japanese soldiers, who were in the service of the Dutch East India Company and formed part of its garrison. The Japanese were now disarmed, and they, as well as the English, seized and imprisoned. They all acknowledged the conspiracy and signed their acknowledgement, "which one can see at length in their declaration, where, among other things, it is admitted that they intended to kill the Dutch governor."

When Towerson was asked what had induced him to engage in such a wicked design, he answered—"Honor and Profit." Being asked from

whom he expected to receive honor and profit and why he wished to seize the fort, he replied "I expected to be honored and rewarded by my country, as it was for her advancement that I was willing to peril my life in the enterprise." After his examination was concluded the governor said to him—"Is this, then, your recompense to me for all the friendship I have shown you?" "If the thing were to be done over again" he replied with a sigh, "I would not do it," which (if the relation be true) was certainly, as the Dutch say, "an admission of his crime."

At this distance of time it is impossible to form a correct judgment of the matter. The argument of the English that it would have been impossible for the conspirators to take the fort is certainly not sound, since, with thirty of their number already within its walls, nothing would have been easier.

It seems probable, then, that a conspiracy did exist, of which the Dutch were only too happy to take advantage as a pretext for seizing the English factories *everywhere*. Le Clerc indeed asserts that, according to the English historian Wilson, the Court of England attached more faith (*plus de foi*) to the Dutch than to the English narration; but in this he is not borne out by the text; Wilson's exact words being,—"This cruelty had made an incurable wound betwixt the two Nations (the Noise of it giving Animosity enough) but that it was new skin'd over, the bloody Garment taken off by Dutch Apologies, and presented at Court with a Face of justice; For nothing must come thither but in such Attire, as the Great Ones about the King will please to put upon it; who might be wrought to any temper by that Forge that could frame such flagitious Actions; For they that had Barbarism enough to perpetrate the one, had Baseness enough to practice the other."

While such was the state of feeling between the two countries the Parliament in England passed the celebrated navigation act (Oct. 9th, 1651) whereby all nations were prohibited from importing in their vessels any commodity "not the growth and manufacture of their own country." This act, although general in its terms, was levelled entirely at the Dutch, who, producing little, were the common carriers of the world; and yet the Parliament went further and granted letters of reprisal to Robert and William Pawlet (who declared they had sustained a loss of twenty thousand nine hundred and seventy pounds sterling from the cruisers of Holland) authorizing them to collect that amount, by the seizure of Dutch merchantmen and their cargoes,

whenever they might chance to fall in with them in "the narrow seas." This high handed measure produced such an outcry in the United Provinces that the States General found it necessary to dispatch a special embassy to England to remonstrate against it.

The ambassadors, who were granted an audience by Parliament, on Dec. 29th, were at once convinced that Cromwell, who had shortly before "longed for a coalition between the two republics which should make their interests inseparable," now as earnestly longed for war; still they had interview after interview with the Parliament, and did not wholly despair of peace until news reached them on the 19th of May that a collision had actually taken place between Van Tromp and the English admiral Blake, when, from the intense excitement of the populace, which made it necessary for the Council of state to provide them with a guard of cavalry for their protection, it was easy to perceive that hostilities could not much longer be avoided.

Van Tromp, it seems, when about to sail from Holland, with a fleet of forty vessels, for the protection of his country's commerce, was instructed by The States General, to use his discretion about lowering his sails and colors to any English men of war he might chance to fall in with, "provided he did nothing derogatory to the honor of The Seven United Provinces"; but he was expressly directed to prevent, at all hazards, Dutch merchantmen from being visited and searched by the cruisers of any foreign power whatever*. Being driven by stress of weather upon the coast of Kent, he anchored in the Downs, and finding a British squadron there dispatched two of his captains to its commander-in-chief, Major Bourne, to inform him that the storm had forced him to seek that anchorage and that as soon at it moderated he would put to sea again—Major Bourne sent a polite message to the admiral in return, say the Dutch, and invited the captains to take a glass of wine with him; but, according to Campbell, Allen, and other British authors, he had the rudeness to reply "that the truth of his story would best appear from the shortness of his stay." However this may be, Tromp left the Downs on the 18th of May, and steered to the eastward, intending, after a few days cruise in the North sea, to return to Holland for the purpose of providing himself with anchors and cables, of which many of his vessels were greatly in need; but he had not gone far when he met "two Amsterdam vessels, whose captains informed him that they had just parted company with seven merchant-men off Dover, which they feared would fall a prey to the English, as they

* See Basnage annales des Provinces Unies, Tom. 1, p. 253.

had observed twelve of the Parliament's war ships bearing down to communicate with them." Upon this, Tromp, in strict obedience to his instructions relative to the protection of Dutch shipping, stood for Dover Roads, where he observed an English fleet of thirteen vessels at anchor, the largest of which, the James, carrying the flag of rear-admiral Robert Blake, afterward so famous in English history, got underway and stood toward him. The situation was critical, and one of grave responsibilty—for in the excited state of men's minds both in England and in Holland a single false step might lead to war—yet Tromp acted with singular judgment, prudence and calmness, signalling to his fleet to furl all light sails and reef top-sails (that his vessels might be readily handled in case he should be forced to an engagement), and at the same time stationing men by his own ensign and flag in readiness to lower them when he should get within the proper distance of Blake. He was, indeed, he says in his letter to the States General, "about to give the order to 'lower away' when a ball from the James whistled above his head." To this he made no reply; but, upon being fired at a second time, he sent a ball across the James's fore foot, which was answered by a whole broadside, when the two flagships, the James and the Brederode became instantly engaged, (9) and the English fleet got underway. The action now became general, and the English were roughly handled until reinforced by Major Bourne with twelve vessels, when the combatants fought on more equal terms. (10) The battle was very hot, lasting from four to nine p. m., darkness at last putting an end to it. The English were terribly shattered in hull, masts, rigging and sails, and their loss in killed and wounded was quite as great as that of the Dutch, yet they properly claimed the victory as they took two Dutch vessels, while not one of theirs fell into the enemy's hands. One of their prizes, however, was retaken by Tromp, the morning after the fight; the prize-crew which had been thrown aboard of her, having abandoned her, through fear of her foundering.

The people residing along the sea-board of Kent were so alarmed when they witnessed the engagement, which, judging of the strength of the fleet from numbers alone, they supposed must inevitably result in the defeat of their countrymen, and a descent of the Dutch upon the coast, that they deserted their homes and fled into the interior; nor would they return to them until Cromwell himself appeared among them, with a large body of troops which he distributed throughout the county, placing strong detachments in Greenwich,

Gravesend, Sandwich and Dover. The voice of the nation, however, was for war, and the Dutch ambassadors, after many fruitless interviews with Parliament, (11) being convinced that it was inevitable, demanded their passports, and war was formally declared between the two nations on the 8th of July, 1652.

NOTES.

1 "Piet Hein," one of the most daring of the early Dutch Admirals, was the son of a poor fisherman of Delftshaven. He accompanied his father on several short cruises, in a herring boat, while quite a child, and, at a very early age, ran away from home and shipped in an East-India-man.

The exploit which gained him the greatest fame among his countrymen was the "cutting out" of a Spanish fleet at Matanzas, Cuba, laden with jewels and silver, valued at some two millions of pounds sterling.

He was killed in 1629, at the age of fifty-one, in an engagement with the pirates of Dunkerque; and Cerisier relates in his *Tableau des Provinces Unies* (Tome VI. p. 40) that the States sent a message of condolence to his mother on the sad event. "Ay, I thought he would come to no good end" was the honest woman's reply, "I did my best to reform him, but he would be a vagabond. I warrant you he has got no more than he deserved."

2 Lettre De Monseigneur le Cardinal de Richelieu á Monsieur le Compte d'Estrades. De Ruel le 15 d'Août, 1639.

Monsieur:—Je vous dépêché ce Courier sur des avis certains que j'ai, que le Roi d'Espagne assemble sa Flote à la Coroque, qui sera forte de cinquante grands Vaisseaux, commandez par Dom Antonis Dognendo, le plus habile homme de Mer qui soit en espagne il doit amener douze mille hommes d'infanterie sur des Vaisseaux pour débarquer en Flandres; l'escadre de Dunkerque so doit joindre à lui. Vous direz à Monsieur le Prince d'Orange de la part du Roi et de la mieune, qúel ne peut jamais trouver une occasion plus favorable pour la cause commune, qui celle de mettre promptement une puissante Flote en Mer, pour aller au devant de celle d'Espagne et la combattre, ni faire rien de plus glorieux pour sa réputation.

Comme ce Prince est lent de son naturel pressez-le de la part du Roi de donner ses ordres à tout les Amirantez d'equiper tous les vaisseaux qui seront en e'tat de servir. Vous l'assurerez en même tems, que le Roi a dépeché des Couriers à Calais, Boulogne, Doeppe, le Havre de-Grace, et Brest, avec des ordres aux gouverneurs, d'assister de munitiones de guerre, d'Hommes & de Vaisseaux, la Flote de Messieurs les Etats, pour les demander que celui qui commande la dite Flote leur en pourra faire.

3 Lettre de Monsieur le Compte d' Estrades à Monseigneur le Cardinal de Richelieu—Du 26 Août, 1639.

Monseigneur,

J'ai rendu compte á Mousieur le Prince d'Orange du Grand Armement de Mer qui se fait en Espagne, dont il n' avoit encore en aucuns avis;

mais le lendemain il recût un expres de Bruxelles, dépêché par le premier Commis de la Secretarie du Gouvernante Général, lequel il a gagné par des présens considerables et qui lui mande tout le detail des desseins des Espagnols.

Tout ce que Votre Eminence m' écrit y est contenu, excepté que Dom Antonio Doguendo ait ordre de rester avec la Flote aux Dunes, pour ne hazarder pas le combat et faire seulement passer l'Infanterié en Flanders par l'escadre de Dunkerque, assistée des Vaisseaux même du Roi 'd Angleterre.

4 Comme Tromp ne vouloit rien faire, que conformément à des ordres Exprès, dans une occasion assez délicate, il en demanda, touchant la conduite qu'il garderoit envers les Espagnols, s' ils demeuroient davantage sur les côtes d' Angleterre. Le 16 du mois, les Etats Generaux lui donnerent plein pouvoir d'attaquer la Flotte Espagnole, et de la chasser des côtes d'Angleterre quoi qu' il en pût arriver.—"*Le Clerc.*"

5 Campbell himself seems to have rather inclined to this belief, for no better reason than because "a popish book was produced in the next parliament, in which, among the superstitious things, were prayers for the holy martyrs who perished in the fleet sent against the heretics in England." It is evident, however, that these prayers were for the souls of the deceased heroes solely of the "*Invincible Armada.*"

6 When Drake took possession of Santo Domingo, there were to be seen in the Town Hall, among other things, the king of Spain's arms, and under them a Globe of the World, out of which issued a horse with his fore feet springing forward, with this inscription, "*Non sufficit Orbis.*"—"*Camden's Life and Reign of Queen Elizabeth.*"

7 In 1623, happened the bloody affair of Ambayna, of which I shall give a short and fair account; because *it gave birth to our national hatred of the Dutch, which subsisted so long and had such fatal effects.—Campbell.*

8 While Cromwell and his adherents, on their part, were extravagant in their clamors for vengeance and satisfaction, in respect to the injuries and insults inflicted by the Dutch; the latter were no less vociferous in demanding restitution and reparation for those depredations which the ships of the former had almost piratically committed against the commerce and property of the latter, under the customary pretence of retaliation and reprisal. Neither party appeared to acquiesce in the propriety of the demands made by the other; and the mutual dissatisfaction which prevailed grew too violent to be appeased by any other means than an appeal, as is customary in all national disputes, to heaven for the justice of each individual cause, and leave the decision to that most tremendous of all umpires—the sword.—*Charnock.*

9 The official reports of the English and Dutch Admirals concerning this affair differ widely, yet I think the reader, who carefully collates the evidence on both sides, will arrive at the conclusion that the English were the aggressors.

Blake was under the impression, it would seem, that the Dutch were bearing down upon him with the intention to engage, and he was not one who was likely to receive an attack passively. Besides his blood was heated with wine (for he had been drinking with his officers in the cabin) and so, he was in no humor to suffer the Dutch to approach within gun-shot of him with their colors flying. "Which of the two was to blame" says Davies, in his history of the Netherlands, "it is impossible to decide. It may be doubted whether Tromp, a zealous Orange royalist was in any hurry to strike to an inferior number of the Parliament's vessels, or whether Blake exhibited much patience in waiting for him to do so."

10 Notwithstanding the numerical superiority of Tromp's fleet, it appears that, in the number and calibre of his guns, Blake was quite on an equality with his antagonist, while the English vessels were so much larger and more heavily built than the Dutch, that they could bear *twice the pounding*, and suffered less from splinters.

11 Il étoit visible par-la que les Fanatiques Anglois, malgre toutes les apparences de Religion, qu'ils affectoient avoient cherché cette guerre; quoi qu'ils 'ne parlassent qui de faire une Alliance avec les Etats, plus étroiete que toutes les précedentes. La dureté et la hauteur; avec la quelle ils traitoient la République des P. P. U. U. etoient tout à fait insupportables; D' autant plus qu'elle ne manquoit pas de flôtes, ni d 'Amiraux, pour opposer a l'Angleterre. On peut-même dire que si les E. E. avoient voulu d'abord équipper des Vaisseaux égaux en grosseur et en équipages à ceux des Anglais, comme ils le pouvoient; les Flottes de la nouvelle République n'auvoient pas pû tenir devant le leurs, comme on le verra dans la suite. *Le Clerc.*

SUPPLEMENT TO THE PAPER ON THE VENTILATION OF SHIPS.

See No. 13, Vol. VI. P. 237.

Since the publication of my paper on the Ventilation of Ships, which I had the honor of reading before the Naval Institute, on the 13th of April last, I have learned that the ventilation of the later monitors was not designed by Mr. Ericsson, but by Chief Engineer Isherwood, U. S. N., then Chief of the Bureau of Steam Engineering. I beg, therefore, to make the correction as early as possible.

The drawings for the ventilating machinery, conduits, et cetera, were made in the Bureau, and tracing sent to the different contractors, who were building the ships, from which they worked.

On board the *Montauk* class and the *Sangus* class the air was drawn down the turrets by the blowers and then forced throughout the vessels; but on board the *Miantonomoh* class it was taken in through a vertical armored cylinder which extended about ten feet above the deck, and was forced throughout the ships, finding an egress through the furnaces, galley and the turrets. By this means the gases from the fired guns were expelled from the turrets instead of being drawn into the ships.

G. W. BAIRD,
P. A. Engineer, U. S. N.

NAVAL INSTITUTE, BOSTON BRANCH,

SEPT. 30, 1880.

HENRY LYON, M. D., in the chair.

DISCUSSION.

THE LAWS OF HYGIENE AS APPLIED TO BERTHING, MESSING, VENTILATION, AND INTERIOR ARRANGEMENTS OF MEN-OF-WAR.

Naval Const. POOK:—I have been asked to say a few words on the subject of ventilation. I cannot think in what way I can do better than to give a description of the system of ventilation as arranged upon the Richmond, fitted at this navy yard, about two years since.

The Bureau of Construction had its attention called to the deficiency in ventilation upon ship board and, upon the representations of its chief, a board was organized by the Hon. Secretary of the Navy, consisting of Med. Dir. Turner, Naval Constructor Fernald, Comdr. J. R. Bartlett and Chief Engineer D. Smith. These gentlemen, coming to the Navy Yard, Boston, proceeded to arrange a plan as follows. A main duct was carried entirely through the ship, below the berth deck, which tapered from the centre of the length to the ends; when the engine room and coal bunkers were reached this passage was carried under the coal bunkers and out of the way of the machinery. Attached to this main pipe were smaller pipes which led into each room and stateroom of the ship; at the ends of these smaller pipes were placed brass registers.

The whole system was arranged to exhaust bad air from all parts of the ship, by the use of a fan blower which was run by a small steam engine at a high velocity. This was placed upon the berth deck. After the bad air was drawn out of the ship, it was passed under the berth deck, through square tubes, to vertical pipes, and into the open air—this was the exhaust method. Now, to supply the fresh air, pipes were arranged along the sides of the ship, wherever there was an opportunity to do so, with valves at the upper end, which could be kept open in good weather.

There was also a cowl of large size fitted on each side forward, which was placed so as to direct the wind into a port about two feet square; this port was boxed in, and was ultimately divided into three compartments, one of which led into the berth deck, another into the orlop, and a third into the hold. The port was fitted so as to be kept closed in rough weather, and the cowl arranged so as to turn around from the wind: at the after end of the ship, there were also fitted large, square ventilators, one from

the hold, the second from the orlop deck, and the third from the berth deck, all leading into a skylight upon the poop deck, which was arranged to close in bad weather.

It was the intention of the original Board, that the ventilation should be so arrranged that the engine should not only exhaust the air, but draw it into the ship,—but this being the first execution of their plan, this part of the work was not perfected. Lately, Assistant Constructor Hanscom has originated a method which bids fair to produce the desired result. This consists of a series of valves so arranged that by one turn of a lever on deck, the engine can be made to pump the air into the ship, or exhaust it, as may be desired—the blower running constantly in the same direction. As it is not always desirable to have fresh air blowing into the room, Mr. Hanscom has introduced two registers, one at the lower part of the room, and the other at the upper,—that at the upper part being for the purpose of exhausting the foul air, and the one at the bottom for the supply of fresh air. This last plan has just been approved by the Bureau of Construction, and will be applied to the Hartford.

Additional ventilation was given to the Richmond, by the substitution of large oblong air ports, having lights nine by twelve inches on the outside, and flaring to openings nearly two feet square upon the inside. By this means double the volume of air that was formerly given to this ship was admitted.

Constructor Wilson has improved upon these ports by the use of a round port twelve inches in diameter, which is hung upon a hinge on the lower edge of the lights, and his attempt is to close the light by the use of a string and clamps or catches placed one on each side of the air port. The catches hanging loosely, hold the port something like the latch upon a gate, and the port is forced back upon its packing by the use of two nuts, one on each side. Mr. Wilson claims that the port thus closed will bear evenly upon the packing, and be made perfectly water-tight, the only objection being the time and the extra trouble it takes, to open the air port, which might sometimes be required to be done quickly. Wilson's ports will be applied to the Hartford, Lancaster and Brooklyn, and as many other ships as possible, it being understood that his port is adopted until a better one is presented. There is no question but that it is very desirable to have a perfect system of ventilation for our ships, particularly upon the berth decks, and no pains nor expense ought to be spared to bring out the best possible plans for their ventilation.

Chief-Eng. TRILLEY. I wish to inquire of Mr. Pook if the spaces between the deck-knees and planking under the spar-deck of the Hartford are to be left open?

Naval-Const. PORK. They will not be left open.

Comd'r AMES. Gum shellac, dissolved and mixed with yellow ochre so as to make a covering paint is the best possible covering for berth and orlop decks. Once a month two coats should be put on berth decks, which can be done between "after breakfast" and supper time, the men staying on the spar-deck. During the middle of the month spots where the most

wear occurs can be touched up. This treatment ensures a hard covering to the deck as easily cleaned and kept dry as marble, and with the proper use of whitewash overhead and good ventilation, as applied to the Richmond, I cannot see why a man-of-war should not be as healthful as any house. I have tried this system thoroughly on board the Kearsarge and Resaca with the best results as to cleanliness and health. I am pleased to know that Comd'r Schley, lately from sea, confirms these ideas in every respect with his own experience.

Commodore RANSOM. I believe that the use of shellac on lower-decks was forbidden by a general order from the Navy Department.

Naval Const. HANSCOM. It appears to me that the closing of these apertures is well enough as far as it goes but the fact is that our ceilings are by no means tight in the seams, and if foul air is confined in the frame spaces it will find its way into the state rooms and on to the berth-deck. What appears to me to be needed is some means of carrying the foul air up and outboard.

Naval Const. POOK. These openings on the berth-deck were formerly left as one means of preserving the timber of the ship. But at the present time it does not seem so necessary, as all or nearly all the timber applied to the naval ships at the present time has undergone a process of preservation. I can see no objection to closing all these openings, provided the process of preservation proves to be all that it is recommended.

Comd'r AMES. On board the Resaca the space under the floor was sufficient for a man to pass nearly the whole length of the vessel, and on this account her bilges could always be kept perfectly clean.

Dr. LYON. Is not that the way in which foreign vessels of war are usually constructed?

Naval Const. HANSCOM. They are generally built in that manner—what is needed in this respect is the raising of the floors of the hold. This would require but a small sacrifice of storage room, while it would make the bilges more accessible. Most naval officers know how difficult it is to keep clean the bilges in the afterpart of our screw sloops, in the shaft-alley et cetera, but with the floors of the store-rooms on either side of the alley raised sufficiently high, apertures can be made communicating from the shaft-alley to the bilges under these floors, thereby affording an opportunity to wash out thoroughly.

Naval Const. POOK. As an instance of the necessity of cleaning bilges, I would speak of the condition of the Monongahela just before her last cruise to the East Indies. When she came to New York, under command of Captain Fitzhugh, the odor on board the ship was intensely disagreeable and unhealthy, coming from foul bilges; at the request of the Captain the ship was docked, and the bilges were thoroughly cleaned, at the same time the store-room and magazine decks were raised, and every part was made accessible for cleaning. I think this cleaning was effectual.

Chief-Eng'r TRILLEY. The bilges of the Vandalia are very accessible, from the shaft-alley to the forward bulkhead of the fire-room. The boilers are placed at a height sufficient for a man to pass underneath. The trouble of

this vessel, from the bilge gases, on her first cruise, arose from the arrangement of the after magazine and store-rooms on each side of the shaft-alley. They were shut off from the shaft-alley by an iron bulkhead and the bilges were inaccessible, so that any foreign substance, lodging under the floors and decaying, caused the foul air to find an outlet into the ward-room state rooms through the apertures between the knees and the spar-deck planking. This was almost constantly occurring, and the smell from the bilge would be very strong in the ward-room when it could not be noticed on the berth-deck, in the engine room and shaft-alley. The boilers of the Hartford are placed very low and I do not think they will admit of a man's passing underneath. I wish to inquire of Mr. Pook, if iron beams were substituted for wooden ones, could not the boilers be raised several inches?

Naval Const. POOK. In regard to the space under the boilers of the Hartford for effectual cleaning, I think a portion of that valuable space is taken up by a series of plates, separated by spools and angle irons as a preventive against the effects of heat; but for these arrangements there would be ample room for cleaning; for instance, if the boilers were placed upon legs, like the Richmond's.

Lieut. BASSETT. I think much can be done in promoting the hygiene of the ship by the Watch, Division and Executive Officers. It is difficult to teach some men to keep clean. Constant and unremitting attention are necessary to teach the apprentices in the training ships to keep themselves and their clothing clean. Men are a little better, but must be watched. Persons, clothing and bedding must be frequently washed and aired, perhaps the latter more often than in some ships. Bathing facilties should be extended. I do not mean to advocate large and well appointed bath-rooms, but I cannot see why, if, as in some ships, the firemen have bathing arrangements, a similar attention should not be accorded to the seamen. As to washing decks, I had imagined that nearly all the medical men took strong sides against it, as we have all heard that holy-stones were to be banished, et cetera. But in reading an excellent paper, read before the Institute, by Medical Director Gibbs, I find that he, at least, seems not to fear that the sailor would, as the old adage has it, suffer more from the water inside the ship than that out of it. But the deck should be dried thoroughly, and it would be better to let it go in bad and damp weather. Drying stoves should be frequently used, and every means taken to dry the deck well.

Comd'r AMES. On board the Pensacola, swinging tables were provided for the crew and were so arranged that in port they could be made solid, stationary tables by placing one of the end swinging supports underneath for legs. These tables gave great satisfaction.

Bag-racks were fitted on board the Colorado under the supervision of that most excellent officer Lieut-Com'dr, now Capt., L. A. Kimberly, and were fitted so that each mess had a rack; the key was always kept by the cook of the mess. This prevented stealing.

I consider lockers, bag-racks and swinging tables all in the direction of improvements in the condition of the sailor, and I feel that with properly shellaced, lower decks, and ventilation as arranged on board the Rich-

mond, all that can be done for the health and comfort of the crew in our present style of ships would be accomplished.

As regards the ration, I am firmly convinced that there is nothing which needs greater reform than the manner of putting up provisions for the navy. The manner in which stores are prepared for use in the far western posts of the army is far in advance of anything that we have, and ensures to both officers and men the best of provisions in almost perfect condition. A study of the methods used in the army purchasing office in Boston would amply repay any one interested in this matter.

Naval Const. POOK. The fitting of the mess tables, bag-racks, &c., is always optional with the Captain of the ship; but most of the ships which have been fitted where I have been, have been arranged without the racks and lockers, as was contemplated by the order of Admiral Porter, made sometime since, in consequence of the want of ventilation, and the dirt which will collect in spite of the utmost care, as well as being receptacles for bugs, mice and other vermin. The greater objection, however being deficient ventilation in those parts, and in consequence a rapid decay.

I have no doubt, however, that tables and lockers can be arranged, and all the parts thoroughly ventilated in connection with a general system of ventilation.

Lieut. BASSETT. As regards the second section of the subject—Messing and Berthing—while we may regard Hygiene and Ventilation as belonging particularly to the Constructor and Doctor,—to line officers principally fall the duty of attending to messing and berthing. The executive arranges the details and the watch and division officers carry them out. As to berthing, I do not see why, if hammocks must swing so closely packed, they cannot be arranged so as to be less in contact. It is hard to see why men are healthy in fully manned ships, when they sleep in hammocks nearly touching, with rows dovetailed between, as closely swung. In iron-clads, on account of the high decks, this is easily avoided. But in our wooden ships why cannot an arrangement like this be made; let the odd numbered hammocks swing as usual up to the beams, while the even numbered, dovetailing between them, are suspended lower by rods so arranged that during the day they swing up to the beams like an iron stanchion. These rods could be fixed by pins and the hammocks hang from the ends of them. Thus there would be rows high up alternating with rows further down. As to messing it is time the old custom of making the men squat about on the decks be abolished. Swinging or folding tables should be used, and thus the men would be better able to eat, feel better over it, and be under better control. Some tables should be left down after supper, and the men allowed to read or write at them.

Lieut. STRONG. I think that it would be difficult to place one hammock under another in our wooden ships, as proposed by Mr. Bassett, on account of the want of space between-decks. We all know how difficult it is to pass along a berth-deck under the hammocks after they are piped down. I agree with the remarks that have been made regarding the use of swinging tables and benches. They serve as a convenient place where men can

read and write, as well as take their meals, and any comforts of this kind which can be furnished to a ship's crew have in my opinion a tendency to make the men more contented and, in consequence, more efficient.

Comd. SCHLEY.—During my cruise recently concluded on the coast of Brazil, west coast of Africa and the Home Station, embracing about thirty-eight months of which nearly twenty-three months were spent actually at sea in weather that was boisterous and often severe, I observed large additions to the daily sick-list of persons suffering with catarrh, rheumatism and other diseases that could be attributed to the decks below. Consulting with my medical officer it was agreed to shellac the berth deck of the ship. It was discovered that a very large reduction took place in our sick-list. My impression now is in the neighborhood of fifty per cent. It seems only fair to infer that it was due to the precautions taken below. In single deck ships as the Essex was, it appears to me hardly fair to the men to deluge the berth-deck at sea while the spar-deck was kept constantly wet by the elements. I have always been a great advocate of sand and the holy stone, but my experience in the Essex convinced me that it was a mistake so far as decks, where men live, are concerned.

With respect to the effect of clean bilges, I would say that while in Rio de Janeiro, in the winter months of 1878, I had several cases of yellow fever on board the Essex. Every case could be traced to the shore, but the cleanliness of the vessel, the crew, and her bilges made it impossible for the disease to secure a lodgment. The employment of rods, spoken of by Lieut. Bassett is practically reached now by long laniards which the men have spliced into the rings of their hammock clews. By this means the men in port where decks are the most crowded are enabled to swing each alternate hammock below the first tier.

The great height between decks in the more recently constructed foreign vessels admits the plan mentioned by Lieut. Bassett, but in our ships would be a serious inconvenience on decks that are now only high enough to allow for passage, while this is not the case in all our vessels.

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Captain H. A. BARTLETT, U. S. M. C. in the chair.

ICE NAVIGATION,

BY LIEUT. FREDERICK SCHWATKA, U. S. A.

This subject, embracing in its whole extent the construction of ships —or altering of those that have seen less severe service,—for this peculiar employment, their management and direction under the various combinations of ice-packs, ice-floes, icebergs, tides, storms, currents, and other obstacles, when they have entered their frigid field of action, their care and preservation when securely anchored by the cold clutches of the ice, for the long dreary winter night of the Arctic, their liberation when the summer's sun has broken up the great ice fields, and their reënactment in inverse order of their former experience, as they prosecute their journey or return home, as will be more likely in the light of past Arctic adventures, can all be more fairly comprehended by following the history of such a vessel through all the above until its return to its native waters, or its crushing amidst the grinding pack or its final abandonment by a long beleaguered crew to the unyielding fetters of the frozen zone; to follow it from its launching back to its lucky laurels or from its dock-yard to its doom.

I will not dwell upon such indubitable facts as the quality of the ship's material, which it is evident must be of the very best, be it wood or iron, or, the almost equally apparent fact of the superiority of a vessel specially constructed for this purpose, in the hands of proper persons, who have had experience in Arctic navigation as well as naval construction over the reconstructed merchantmen or even stronger built man-of-war.

Nothing is more favorable to ice-navigation than a propitious season, and the history of the Arctic is replete with instances where different explorers, at different times, have found the most startling variations

in the state of the ice, in the same locality, and at the same corresponding time of the year. So well is this fact appreciated by experienced navigators of these waters that you will seldom find one give that credit to Arctic success which is so often so fully accorded by the press and the public. Rightly estimating that it was not altogether superior management over his more unfortunate brethren, but largely due to the fortunate circumstance of a lucky season, which is a problem defying calculation. Lieutenant Payer of the Austro-Hungarian expedition has pointedly said: "The commander of an expedition must possess sufficient self-control to return as soon as he becomes convinced of the existence of conditions unfavorable for navigation. It is better to repeat the same attempt on a second or even a third summer, than with conscious impotence to fight against the supremacy of the ice." Splendid as this maxim appears upon the face of it, it nevertheless has the weak point that it is based on things as they should be, rather than on things as they are, and should any Arctic commander, actuated by honorable motives, adopt such a course, he would probably find this maxim, when he returns home, exchanged for that one of Napoleon that "there is nothing so successful as success"; and should the same attempt be repeated on a second or third year it is more than doubtful whether he would find himself retaining his orignal position. It is often this unfortunate relation existing between an ambitious commander and his inexperienced countrymen at home that has done so much to add to that huge list of rotting hulks and human bones which form a necklace of honor around that pole they could not reach. But let us return to our ship and determine in the scales of experience of what material she shall be made. These tell us that the superiority of iron ships over those of wood no longer holds in the Arctic. The rapid conductive power of the former makes it almost impossible to keep an equable temperature in any portion with out a thick inside coating of some non-conductor, besides the more rapid formation of frosts from condensed moistures along the outer sides of the bunks, causing serious diseases, and greatly aiding the propagation of that most terrible of all Arctic scourges, the scurvy.

The superior strength and endurance of iron over wood in the usual accidents of the temperate and tropical seas seem to be lost when the test comes in the shape of severe pressure from the ice, the elasticity of the wood allowing it to return to its original shape after an almost indefinite number of nippings which are not sufficient to directly crush the vessel, while the same number of equal pressures in its iron com-

panion become slowly accumulative, until it finally succumbs. A wooden vessel, however, may be very properly plated with iron over the hull, for some feet under the water, to protect it from the grinding action of the "ice tongues," which are formed by the unequal melting of the edges of large ice cakes, and projecting their huge submerged points, often for a distance of twenty or thirty feet, become dangerous to a vessel compelled to thread narrow and tortuous channels and "leads" in an open field of pack-ice, where the first intimation of their presence is a low, dull, groaning sound, and a swinging of the ship, probably a half a dozen points of the compass, despite the helmsman, or probably a perfect arrest as the helpless ship comes up broadside on against the cake of ice, and with all sails thrown aback, if that be her motive power. Theoretically, therefore, iron ships are inferior to their weaker but more elastic wooden compeers, and this theory is ably demonstrated by facts in the sad fates of the River Tay in 1868, in Baffin's Bay, and of the Swedish exploring ship Sophia in the north of Spitzbergen; in both instances these vessels sank under circumstances where good wooden vessels would have survived.

Having decided to build a wooden vessel the shape of the hull is not a matter altogether of perfect indifference. The full round ship, or, nautically speaking, a ship with full lines is much more liable to be crushed by ice-pressure than one built with sharp lines, as fully illustrated in Koldewey's German expedition when the Germania, built upon the latter principle, stood the ice-nip without very serious consequences during a heavy storm, while her companion the Hansa was crushed and sunk, she being modelled upon the former plan, and this despite the fact that the Germania was the larger vessel and therefore more liable to destruction than her lighter escort. This last statement would bring us to a consideration of a proper size for an Arctic exploring ship, and while this may vary through tolerably wide limits, depending upon the equally diverse objects to which she may be put and the time she is to be employed in icy seas, still the general principle that a vessel should be as small as possible, compatible with the object in view, is a good one. The smaller and lighter the boat the easier she is to raise by the squeezing floes; and this lifting of a vessel from the glacial vice, in some cases completely from her element has been the salvation of many an ice beleaguered boat. The superiority that a large vessel has over a smaller one in its greater momentum, when called upon to "ram" the ice, so as to force a passage, is compensated by the fact, which experience has fully corroborated, that the large ship

will succumb sooner to these severe and repeated shocks that she is thus compelled to bear. It should be added that it is only when the floes are small, and the ice comparatively loose, that *any* ship, whatever may be her size, can ram it with any fair prospect of effecting a passage through. Again a small ship is more readily handled in the tortuous channels through which she is often compelled to thread her way while working in floes sufficiently open to just allow progress. While all Arctic authorities agree upon the employment of small ships, the exact size in tons is seldom stated, but in the few cases mentioned about four hundred tons may be taken as the maximum limit.

The charging, ramming, or pushing of ice, by a vessel, brings us to the consideration of the motive power most serviceable for ice navigation—steam or sails alone—for it is only by the former that charging can be made possible, except in these extremely attenuated packs where the headway of the sailing craft is sufficient to carry her safely through, but it must be added that such packs are seldom encountered. The use of steam may be laid down as a positive rule to be all important, despite the fact some few persons of no inconsiderable experience as Arctic navigators still denounce the waste of room occupied by the steaming machinery, its necessary fuel for so long a journey, and the almost triple anxiety imposed upon the commander regarding his propeller, which is constantly breaking its blades despite its protector of iron grating, and other derangements of machinery that may here become extremely difficult if not impossible of repair. The first attempt to use steam power in the frigid zone was essayed by Sir John Ross in the Victory, a small vessel of but eighty-five tons, which sailed from England in 1829, carrying sufficient coal for one thousand hours steaming. At that time the screw-propeller was unknown, and the Victory was fitted up with paddle-wheels, which proved so utterly worthless in the very first ice they met, which, added to an unfortunate accident which permanently disabled the engineer, and the constant attention the new machinery required, finally forced Ross to fall back wholly upon his sailing power, with which he continued his journey, at last abandoning the Victory in Prince Regent's inlet, the first he had lost of thirty-six vessels that he had commanded during forty-two years' service. This complete failure of the paddle-wheel in ice-packs, however slight, fittingly fixed their doom forever.

The first use of the screw-propeller was on Sir John Franklin's ill-fated expedition in the Erebus and Terror in 1845. How effectually they worked, like all other information concerning that party, is wrap-

ped in mystery. Certain it is Sir John Franklin came nearer accomplishing his object than any of his predecessors, but whether due to his propellers or to a favorable season can only rest on conjecture; suffice to say they were certainly not powerful enough to release him from his two years' besettal in the ice-packs of Victoria strait, unless the cause was due to a scarcity of coal. With the various improvements in propellers, especially in their protection and other adaptation to this peculiar service, came their more universal use in Arctic navigation; and at this date one seldom hears of an expedition to these regions not thoroughly fitted with this most essential auxiliary to a perfect success. By steam power only can a vessel defy the ever variable winds of those regions.

Running before a breeze and with a current in the same direction is the most favorable condition that can be secured for a sailing craft, not on account of speed which is thus facilitated (for a vessel in the ice should under no circumstances, be she steamer or sailer, exceed six or seven knots per hour, while three or four is not a bad average to adopt), but on account of the disjointed and open condition of the ice-pack that is produced by this state of affairs. Even in this most favorable state, if she be running towards the narrow portion of a funnel-shaped channel, she will more than probably encounter a gorged ice-pack at this point barring her further progress. A sailer caught in this predicament is in a very precarious condition. To attempt to return against both wind and current is sufficiently hard, as all sailors know, but when there is added to all this the incoming pack-ice, which will certainly add two to three and often four or five points to her lee-way, in constantly attempting to weather the large ice-cakes and often equally dense and larger ice-packs with fruitless results, the time lost in wearing her around or throwing her on the other tack when a channel open one minute has closed in her front, makes it almost if not quite impossible to return, and the grinding, crushing pack soon builds up to her position and encloses her under the most dangerous circumstances that can occur in ice-pressure, unless she can find an "ice dock" like that described by Dr. Kane, and even this, at any minute, is liable to be obliterated by an increase of wind or a pressure due to the accumulation of ice or change of tide. This state of affairs is, I think, more than probable, illustrated in the case of the besettal of Sir John Franklin's expedition, the Erebus and Terror, in September, 1846, off Cape Felix of King William's Land. Attempting to pass through Victoria Channel, whose southward trending current is at this point

greatly narrowed by the converging shores of Victoria Land on the west, and those of North Somerset, Boothia, and King William's Land on the east, his propellers worthless or his coal supply short, he must have encountered this ice-gorge so late in the year that his ships were almost immediately frozen in, or the summer's winds held him against or in the pack as already indicated. The latter reason seems to me very reasonable, for, during the time my party was on King William's Land, from the time the ice broke up in Victoria channel on July 24th, 1879, until the ice, newly forming, was sufficiently thick to stop a sailing vessel, which was about the middle or latter part of September, I was forced to notice an almost continuous North-North-West veering to North-East wind, evidently caused by the warm rays of the never-setting summer's sun heating and rarifying the atmosphere over the vast snowless plains of upper British America, whose place is filled by the denser air chilled by the great ice-fields of the Arctic ocean. That this Victoria channel is navigable under very favorable circumstances is shown by the fact that one of these two ships afterwards floated down or sailed through this strait to near the mainland of America, some one hundred and fifty miles, manned by not more than four or five men. On the contrary a steam-vessel may move or escape in any direction the only requisite being a sufficiently open pack. When the state of the ice becomes very favorable, and liable to remain so for some time, she may bank her furnaces, and with all the advantages of a sailing craft prosecute her journey, being ready to steam up at the very first threatening of any obstacle that would require the use of that power to overcome. Although good Arctic authority has said that "the making fast to a floe should never be attempted, except when every hope of navigating in the surrounding waters has been fruitless," and further adds, "as a principle, and so far as it is possible without the exhaustion of her powers, a ship in the ice should endeavor to be in constant motion, even though this entail many changes of her course and the temporary return to a position which had been abandoned," (Payer) still the latter suggestion involving, as it may for a great period of time, the consumption of coal, and in regard to the former suggestion, the many cases where vessels with banked fires have fastened to floes with their ice-anchors, ready to escape almost at a moment's notice, makes these cases of advice not strictly essential in steamers, if they be properly harbored under the lee of the ice. With a sailing vessel this resource becomes much more dangerous. The fastening to an iceberg is not altogether unattended with danger and

should only be resorted to when other means of safety are remote. The Polaris was justified, in such an instance, in seizing on to Providence Berg, although I have seen some contrary opinions expressed. A sailing vessel should only do this when it becomes necessary to avoid drifting into a more perilous position.

Again, a steam vessel can go into harbor later than one with sails, and this is of some importance considering the short season during which navigation is at all practicable. This arises mostly from the superior advantage in charging the newly forming ice of the early fall, or "young ice" as it is generally called. The action of a sailer in this "mush ice" is so well described by Sir Edward Parry, who had seen five Arctic expeditions, all in sailing craft, that I gladly transcribe it *verbatim et literatim*. "The formation of young ice upon the surface of the water is the circumstance which most decidedly begins to put a stop to the navigation of these seas, and warns the seaman that his season of active operations is nearly at an end. It is indeed scarcely possible to conceive the degree of hindrance occasioned by this impediment, trifling as it always appears before it is encountered. When the sheet has acquired a thickness of about half an inch, and is of considerable extent, a ship is liable to be stopped by it unless favored by a strong and free wind; and even when still retaining her way through the water, at the rate of a mile an hour, her course is not always under the control of the helmsman, though assisted by the nicest attention to the action of the sails, but depends upon some accidental increase or decrease in the thickness of the sheet of ice, with which one bow or the other comes in contact. Nor is it possible in this situation for the boats to render their usual assistance by running out lines or otherwise; for once having entered the young ice, they can only be propelled slowly through it, by digging the oars and boat hooks through it, at the same time breaking it across the bows, and by rolling the boat from side to side. After continuing this laborious work for some time with little good effect, and considerable damage to the planks and oars, a boat is often obliged to return the same way that she came, backing out in the canal thus formed to no purpose. A ship in this helpless state, her sails in vain expanded to a favorable breeze, her ordinary resources failing, and suddenly arrested in her course upon the element through which she has been accustomed to move without restraint, has often reminded me of Gulliver tied down by the feeble hands of Lilliputians; nor are the struggles she makes to effect a release, and the apparent insignificance of the means by which her efforts are opposed, the least just

or the least vexatious part of the resemblance." (Parry's second Voyage 1821-22-23.) A sailing vessel caught in this unfortunate state of the ice, must, as Parry says, immediately seek winter quarters in the nearest harbor, and if that be remote and the wind unfavorable or rather, unless it be extremely favorable, the crews will be forced to cut a channel the entire distance for the helpless ship. This Parry was forced to do in 1819, near Melville Island, the channel cut being nearly three miles long. On the contrary with steam power, ice only a half an inch thick is an insignificant obstacle and a vessel thus equiped can steadily force her way through such a thin sheet, while even that proportion of a yard can easily be overcome by charging, requiring only well strengthened bows. Another great advantage of steam over sail power is in the case of a calm with a strong tidal or other current setting towards an ice-pack or stranded iceberg; the salvation of the latter depending upon the relative power of the current and the strength exerted by her small boats to tow her off, while the easy escape of the former is obvious. Also, in the early and late navigation of these waters, the sails are liable to become completely clogged with ice and sleet, rendering them, in extreme cases, impossible of manipulation. This state of affairs nearly proved fatal to the Griper, Captain Lyon, Royal Navy, in September, 1824, in north Hudson's bay, while attempting to battle with a terrible two day's storm, the sleet forming over a foot thick on his decks and proportionally over other parts of the vessel. I should not have entered into so long a discussion on the seemingly palpable superiority of steam power over that of sails, was it not for the fact that such a great proportion of the Arctic expeditions are of a private nature, wherein the means of the liberal donor or donors can not reach the increased expense of steam machinery and fuel, and the undaunted ambition of the contemplated commander, officers, and crew, accept the situation rather than await the vacillation of government aid. Our vessel having filled as many of the above requisites as possible, and being on her way, accompanied by a transport,—if she be a steamer—whose stores of coal and other articles are to be transferred when the ice becomes dangerous for such a craft (presumably not strengthened for that purpose) we will, no doubt find her encountering her first true Arctic experience in iceberg navigation, especially if she be heading against some of those great polar currents which sweep by glacier-bearing lands. In the Atlantic, the great oceanic base for by far the larger number of Arctic expeditions, these monster mountains of ice sometimes reach as low as 40° N. Lat. They are to

be dreaded mostly in the night or sometimes in very heavy or very foggy weather. This danger, therefore, steadily decreases as the ship nears the pole, and near the Arctic Circle when she will encounter perpetual daylight, it ceases. It is in the lower latitudes, and especially during dark, foggy nights so common to these regions that the sharpest look-out must be kept, and here also the berg meeting more temperate waters and warmer climate is, in its disintegration widely surrounded by a vast debris of smaller masses most of which are equally as dangerous as the parent berg.

There is one peculiarity of icebergs that is fortunate for those cruising in their vicinity, and that is their visibility at quite long distances during the darkest nights and the heaviest of weather. I remember on the 10th of July, 1878, while making for the eastern entrance of Hudson's strait, and while off the Labrador coast, our second mate, a keen-eyed Scotchman, caught the faintest glimmer ahead, during a misty, thick fog, about 2 o'clock in the morning, when daylight had hardly commenced to break. He estimated it to be about three miles away, and wearing ship and laying to, we discovered in the morning that his conjectures were about right. This monster colossus of ice was flanked on either side by its debris for three or four miles, some of the pieces standing fully as high as the foremast of our little schooner. To my unseamanlike eyes, even with the aid of a powerful marine glass, I could only make out what seemed to me to be the very slightest break in the dark, inky clouds hugging the horizon, and the mate told me that the navies of the world, a score abreast, could have passed half way between us, and Argus himself would never have seen them. It is the peculiar sheen of their polished faces that penetrates so far, and under circumstances where a bank of snow or a ship's sails of the same size would be invisible. If a ship is approaching icebergs and their accompanying fragments, repeated observations made by plunging a thermometer into a bucket of water drawn from alongside soon shows the fact by decreasing temperature; and these observations are more valuable in the summer than in the winter months, and also the farther south the ice may be encountered, owing to the more rapid change in the observed temperatures under these circumstances; but, as all Arctic navigation is performed in the brief summer of these regions, and as it is only in the lower latitudes that the nights, at this time, are sufficiently long to cause apprehension, these observations become doubly valuable. In the winter season, if the temperature of the water falls as low as 34° F. from a previous higher standard, it may

reasonably be inferred that ice is not much farther away than half a mile, and due precaution may be taken accordingly. 42° F. would show about the same distance in the summer time, the thermometer falling rapidly as the vessel approaches. It should be remarked that the thermometer shows a higher temperature in the deep than in the shallow water on banks, shoals, and near the coast line, often falling from 2°F. to 6° F. as the latter are approached. But a good chart and a fair degree of accuracy in dead reckoning will avoid confounding this with the decrease due to approaching ice. After the ice has been passed, although it may not have been seen, owing to the darkness or weather, this fact is soon revealed by the little detective by a rise of its mercurial column. There are many instances recorded where vessels, by an attentive series of these thermometrical observations, have escaped destruction in the iceberg regions, and I am sorry to state that there are other instances of disaster that could, no doubt, have been avoided by a timely recourse to this simple expedient. In the case of an iceberg stranded in a current, it is evident that even this valuable sign will fail on the current-washed side, as the chilled waters are swept away in the opposite direction as fast as formed; so that when a vessel is running with an ocean current where a berg is liable to ground, or, where from its great depth, the berg is subject to some more powerful under-current than exists on the surface, the only safeguard is in a vigilant lookout. A sailing vessel should never approach an iceberg too closely if there is danger of becoming becalmed, especially in warm waters, as there disintegration if of a colossal nature is sufficient to throw the largest ship on her beam ends if taken at a disadvantage. Sir John Franklin had the ship's pinnace of the Trent, thrown ninety-eight feet by the disruption of an iceberg, about a half a mile distant, which so completely stove the craft that they were forced to a very annoying delay to repair it before they could return to the ship. This rupture had been determined by the firing of a musket by one of the party. Even if there be a good wind there is considerable danger, in running under the lee of a large berg, the eddying of the wind forcing the ship upon the ice.

The next difficulty that our Arctic voyagers will encounter will be the outlying ice-packs, and much of this subject has already been described in discussing steam power *versus* sails. The commander now has probably the choice of two methods of reaching his destination, or rather two routes, one of which is to keep well out to sea, if the breadth of the channel will permit, and the other is to hug the shore-line like

the little coasters plying between near ports. This subject, like that of steam, seems to be pretty well settled at this hour and in favor of in-shore navigation. Practically illustrated by Barentz, Henry Hudson, Baffin, Sir John Ross and others, including the whalers constantly visiting these climes, it was reserved for Sir Edward Parry to bring the matter in such prominent light before the public as to provoke the most bitter discussion, revive all previous experience on the subject, and institute the most thorough investigations for the future, with the above results. Of this subject, he says, after returning from his first voyage: "Our experience, I think, has clearly shown that the navigation of the polar seas can never be performed with any degree of certainty without a continuity of land. It was only by watching the occasional openings between the ice and the shore that our late progress to the westward was effected; and had the land continued in the desired direction there can be no question that we should have continued to advance, however slowly, toward the completion of our enterprise." In his second voyage he reiterates substantially the same opinion. So necessary was the continuity of land considered by the British Lords of the Admiralty, after Parry's able practical deductions, that several expeditions were by them fitted out to explore the Arctic coast-line of the North American continent, to determine this shore in order to more intelligently direct a vessel through the north-west passage in conformity with this idea. One of the greatest advantages of coast-water navigation over that more remote is the assurance of a winter harbor should the young ice form so rapidly as to prevent further navigation, a not unusual circumstance in these regions where the change of season is short and decisive. Another consideration on in-shore navigation I will give in the words of its author, Lieut. Payer, who says: "A strip of open water which retreats before the growth of the land-ice only in winter, forms itself along coasts, and especially under the lee of those exposed to marine currents running parallel to them; and this coast water does not arise from the thawing of the ice through the great heat of the land, but from the land's being an immovable barrier against the wind, and therefore against ice currents. The inconstancy of the wind, however, may baffle all the calculations of navigation; for coast water, open as far as the eye can reach, may be filled with ice in a short time by a change of the wind. Land ice often remains on the coast even during summer, and in this case there is nothing to be done but to find the open navigable water between the extreme edge of the fast-ice and the drift-ice. Should the drift become

pack-ice, the moment must be awaited when winds setting in from the land carry off the masses of ice blocking the navigation, and open a passage free from ice, or at least only partially covered with drift-ice." It is evident that navigation in coast waters must be slow and gradual, though it has always been attended with the greatest advantages. Still another important advantage of coast water navigation over that remote from land, and which I do not see mentioned by any Arctic authority, is in the fact that if the body of water in which the vessel be cruising is of considerable extent and ploughed by ocean currents, the ice well out to sea does not become fixed nor solidly frozen during even the severest winters, and a vessel thus embayed is at the mercy of the ice-packs and currents, at a time when even if she were liberated the intense cold of that season would make it rigidly impossible to manipulate her, and, in fact, a liberation under these circumstances would be the very last thing to be desired. The Tegetthoff in her memorable drift was thus fortunate, and Sir John Franklin's ships had the advantage that Victoria channel, through which it seems they attempted to take the middle course, is sufficiently narrow to freeze from shore to shore, and prevent the miseries of a winter's drift. Sir George Back, in the Terror, drifting through Fox channel and Hudson's strait in the winter of 1836-37, did not fare so well; and his terrible sufferings, unable to house his vessel in snowbanks which were constantly torn from his ship's sides by the ceaseless disruption of the ice-fields, as fast as made, and many times forced, during heavy gales, to hastily abandon his ship, with a scanty supply of clothing and food in the Arctic winter night, expecting the crushing of his vessel in the whirling, upheaving floes, by his experience shows plainly the great extent of misery and sufferings which a crew may be called upon to bear when not safely harbored for the winter. In-shore navigation is not without its hindrances, however, and especially is this the case where the water near the coast is very shallow, and this which could be only remedied by a light-draught vessel, has the disadvantage that such a vessel can not conform to the build already indicated. This is peculiarly the case on the Polar shores of the mainland of America, Asia, and Europe, while in the channels and waters north of them, the land rises higher, the navigable water approaches more closely to the shore, and progress forward becomes more easily assured. Also in coast water cruising, a vessel forced upon the shore by the incoming pack-ice, backed by a heavy gale, is in a more precarious state than one simply grounded or lifted upon an ice-field.

A ship once fairly beset and strongly held during a gale is completly at the mercy of the elements, and there can be no real good accomplished by the severe tasks of warping and continual shifting of ice anchors which only exhaust the crew and render them more or less unable to take a thorough advantage of a favorable situation should one occur. Parry, however, under these circumstances did not hesitate to employ his crews to their utmost at the hawsers and sails plainly acknowledging that "the exertions made by heaving at hawsers, or otherwise, are of little more service than in the occupation they furnish to the men's minds under such circumstances of difficulty; for when the ice is fairly acting against the ship, ten times the strength and ingenuity could in reality avail nothing." But the greater majority of ice navigators are now decidedly of the opinion that it is best to yield to fate and reserve the men's strength for palpable efforts. Still, in these besettals, the mind of the commander must be ever active, for now events follow each other so rapidly, that a favorable chance for rescue is passed before it can be fairly weighed in all its aspects. Sir John Ross aptly describes such a situation when he gives a scene in his Arctic experience during a heavy gale with his ship the Victory in the ice-pack of the Gulf of Boothia: "The attention is troubled to fix on anything amid such confusion; still must it be alive, that it may seize on the single moment of help or escape that may occur. Yet, with all this, and it is the hardest task of all, there is nothing to be done, no effort to be made. The navigator must be patient, as if he were unconcerned or careless, waiting as he best can for the fate, be it what it may, which he can not influence nor avoid."

A ship may winter in the ice under somewhat varied circumstances. She may be drifting in the pack during this time, unable to make a harbor, as in the cases of the Terror, Tegetthoff, Fox, and others; or she may be frozen in in the hammocky pack but not subject to drift although not in harbor, or she may be safely ensconced in some good sheltered haven. In the first case, the most dangerous of all, but fortunately the least numerous since the employment of steam, nothing can be done but await events. A northward drift is a most perilous circumstance, and although in the only case on record—that of the Tegetthoff—the crew managed to escape, it was only by a miraculous combination of favorable events. It is this fact solely that has led so many Arctic expeditions to follow that continuity of shore land which is swept by southward trending currents in preference to all others. Many Arctic sailors of experience have even strongly contended that it

is a matter to be at once considered, when a ship is thus probably circumstanced, if she should not be immediately abandoned before the northing gained would seriously compromise all hope of escape. In a winter's drift it is impossible to properly "bank" a vessel, as the encasing with snow-walls is generally termed, and it is consequently a severe labor to keep an equable temperature in the unprotected ship. In the case of the unfortunate Tegetthoff, Payer says, that "while in the berth close by the stove, there was a temperature ranging between 100 F. and 131 F., in the other, there was one which would have sufficed for the North Pole itself. In the former a hippopotamus would have felt himself quite comfortable, and Orel, the unhappy occupant of it, was often compelled to rush on deck, when the ice-pressures alarmed us, experiencing in passing from his berth to the deck a difference of temperature amounting to 189°F. In vessels properly "banked," on the contrary, no such variations of temperature need be encountered, even in the severest weather." This "banking" is most conveniently done by Esquimaux, when their services can be secured, as their superior ingenuity in snow construction enables them to enclose the vessel in even several concentric snow-houses thus securing the most complete and equable temperature, with the least amount of material, which is quite a consideration when this monstrous mass has to be removed in the spring in order to float the ship.

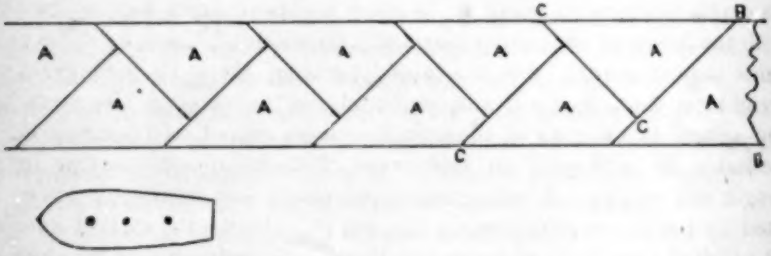
"It is an ill wind that blows nobody any good" and even the drifting winter-beset ship has some advantages in this condition which it would not be uninteresting to note. If drifting towards more temperate waters, as is generally the case in following the more usual routes, she is almost certain of a safe and speedy release in the early spring months, and the constant state of alarm experienced by all ships crews while in these involuntary journeys, from ice-pressures and threatenings of a general destruction of the ice-fields has almost its compensation for good in the necessarily banished *ennui* and lonesomeness of the long polar night with its accompanying evils of idleness and disease. Forced activity to overcome lonesomeness soon wearies, loses its effect and becomes really a punishment, while that prompted by danger never loses its stimulating effect while based upon the inherent dispostion to self preservation.

A vessel wintering in the ice, unable to secure a harbor, but not subject to drift, may be subject to much danger when the fields break up in the following summer, and this danger will generally be greater the farther she is from land, owing to her earlier liberation, probably

long before the navigable season may commence. In a vessel far from land much of the benefit derived from the voluntary exercise indulged in by the crew by short rambles, hunts, etc., especially in the early spring and late autumn when it is of the most value, is necessarily lost.

A vessel safely anchored in a good harbor is necessarily in the most favored condition of all. She may unbend her sails, lower her yards and topmasts, presenting a mimimum of surface to any gale, while awaiting her freezing in, which is especially necessary when the character of the bottom of the harbor is such that there is danger of dragging the anchor. Once frozen in securely, the anchor is raised, the rudder cut out and unshipped, and all these with the stores and provisions may be placed on the shore conveniently by and there room be made for the winter's entertainments, exercises and studies. A vessel is then "housed in" which is done by building a shed over the upper deck with lumber brought for that purpose. This house should be about seven feet high, the lumber covered with canvas, this with a layer of moss or turf six or eight inches thick, cut in the early fall before it has frozen, and dried as much as possible, and this layer of turf again covered with from three to four feet of snow, which should be continuous with the snow walls or snow heaps placed along the sides of the ship. Light is secured by large, thick blocks of ice placed in the sides of this "house" at convenient intervals. If turf or canvas is not employed the temperature of the "house" must be kept below the freezing point or the continual melting of the snow forming pools of ice on the ship's deck will be disagreeable in the extreme; also, a housing solely of canvas, as has been often employed, prohibits the use of a thick layer of non-conducting snow or turf, and, except during a wind, it is but little better than no protection at all. The housing should extend the whole length of the ship if possible, but if cut short at the middle portion, a not unusual method to save lumber, the exposed deck should be treated to a covering of snow and turf similar to that placed on the house. Where moss or turf is not to be had fine sand is almost equally good, but is much heavier and can only be used on horizontal or slightly inclined surfaces. The importance of securing a winter harbor near where Esquimaux can visit the ships is not to be over estimated. The clothing procured from them is far superior to any that can be manufactured in civilization for withstanding the severe temperatures of those regions; their companionship does much to alleviate the lonesomeness of the winter's solitude, for they are generally a most cheerful, merry hearted, and contented race,—their services in procuring game

from both land and water to keep the crew in a healthy state and especially to combat the scurvy is apparent, while in case of disaster their humble abodes are always open to the shipwrecked sailor until there can be convenient times for retreat to reach more civilized succor—a retreat in which the white man may be greatly aided by the native method of transportation. A fire hole being dug in the ice near by which must be opened every morning and evening, and a snow house thrown over it, if natives are convenient, to protect it from drifting snow, and our ship is ready to pass her Arctic winter unmolested until the coming summer opens a renewal of her labors. Should the circumstances of the case warrant an early start in the season, it will probably be necessary to cut a very long channel through from six to ten feet of ice of sufficient dimensions in length and width to float the ship to the outer open water. This channel is generally constructed as shown in horizontal projection in the following figure.



The channel B. B. B. B. is always brought up *alongside* the ship, as shown, since should she draw more water than the thickness of the ice, and the channel be brought up immediately under her, the outgoing tide or a strong wind might sweep her out before it was intended she should move. The scarf lines cc. cc., formed in sawing, are sufficiently intelligible to be understood without an explanation, the ice-blocks A. A. A, being allowed to float out along with the ebbing tide, a single person directing each one as fast as sawed off to prevent its rotation and consequently binding in the channel. If the vessel delays her starting until after the solar rays have made considerable impression on the ice of the harbor, it will save much labor to remove the snow along the contemplated scarf-lines of the channel, and place thereon a covering of black seaweed, sand, dirt, or ashes which will have cut deeply into the ice by the time the sawing is necessary. These layers, of course, should be very thin, otherwise they will protect the

ice instead of acting as ready conductors of the sun's heat. A little funnel-shaped harbor with but few projections along its converging sides may sometimes be relieved of all its ice at one time by a small amount of sawing along these serrated edges and a happy combination of tide, wind, and good management. This is especially the case where the rise and fall of the tide exceeds the thickness of the ice, the consequent vertical oscillation of the ice keeping it broken up in hummocky masses along the shore line. The use of blasting apparatus has so far been of but little use, wherever used, still I think a series of small charges, fired electrically, giving rather a pushing than a concussive effect, might be used advantageously in removing quite large masses of obstructing ice. Blasting, I believe, would also be more efficacious in harbors not fed by fresh water streams, as here the ice is more brittle, less tenacious and elastic, and consequently harder to remove by the percussive power of explosives. The difficulty of sawing increases in a rapid ratio with the thickness of the floe, and when its depth becomes so great as to allow a play of but a foot or two with the ice-saws it becomes essentially impossible. Ice-saws if very thick impose severe labor on those operating them by their great weight; if thin, they will warp and cramp in the thick ice, also creating severe labor. As all these contingencies cannot be foreseen it is desirable to have quite an assortment of these utensils varying in length and weight. A sailing vessel can nearly wait until she is liberated by the forces of nature, as this will probably be the earliest date at which she can take advantage of the season owing to her peculiar motive power. While a vessel is certainly safer when in harbor, this position may not always be without its dangers. She may have entered such a haven during an exceptionally open season and unless this recurs within the limit of time allowed by the ship's provisions she must be abandoned to save the lives of the crew. Such was the experience of the Investigator, abandoned in 1854, in the Bay of Mercy, Bank Sand, by Mc Clure of the Royal Navy, while on a search for Sir John Franklin.

It would be a useless waste of time to go into the various advantages derived from employing two ships instead of one wherever the funds available will allow such a course. It proved the salvation of Parry on his third journey and other instances are not wanting. They should both be provided with equal motive power, steam or sails, in order to prevent separation. The use of balloons to make slight ascents—they being made fast to the ship—to enable the ice master to obtain a more

comprehensive view of the state of the ice, has never yet been experimented upon, though by many recommended, and consequently cannot be either rejected or accepted as an auxiliary in this sort of cruising. Certain it is, however, that nothing is more deceitful than ice packs or ice drifts at a distance, the most invulnerable looking, upon a closer examination, proving to be the most disjointed oftentimes, and the reverse.

Although from this rather long list of probable Arctic accidents to which a ship is exposed escape would seem rare, yet after all it is wonderful the small number of craft actually lost in this dangerous species of navigation, in proportion to the whole number engaged.

The compass, that all important little guide in more favored zones, here becomes almost practically useless. In North Hudson's bay and strait, and, in general, near the magnetic pole, its sluggish oscillations are easily overcome by the most insignificant local attraction, which it is impossible to avoid upon shipboard. The farther removed from this great center of magnetic force, necessarily the more reliance can be placed on the needle. While in this district the direction may be approximately determined by a watch or chronometer rated to mean local time conjoined with the well known uniform motion in azimuth of the sun which, barring cloudy weather, will be continually in sight during the twenty four hours during the greater portion of the voyage. This direction will be sufficiently exact for a navigation which after all depends rather on the bearings of the "leads" and ice barriers than on any determinate points of the compass. The fact that a vessel should follow a continuity of land, as already described, lessens the value of this instrument while capes and headlands can be kept in view.

PRIZE ESSAY

1880.

NAVAL INSTITUTE, ANNAPOLIS, MD.

FEBRUARY 18, 1881.

Rear-Adm. G. B. BALCH, U. S. N., in the chair.

The meeting having been called to order, the Cor. Secretary, Prof. C. E. Munroe, stated that he had received from the honorable Secretary of State, the eight essays forwarded to him in Jan. 1880, by Lieut. J. C. Soley, at that time Secretary of the Institute, together with the following letter:—

"The undersigned to whom it was referred to examine the essays submitted in competition for the prize offered for the best, by the Naval Institute, having performed the duty with which they had the honor to be intrusted, award the prize to the essay identified by the motto, '*Sat cito, si sat bene.*'

Washington, Feb. 10, 1881.

W. M. EVARTS,
R. W. THOMPSON,
J. R. MC PHERSON.

Prof. Chas. E. Munroe,
Cor. Secretary U. S. Naval Institute,
Annapolis, Maryland."

Prof. Munroe further stated that the Executive Committee had resolved to postpone discussion upon the Prize Essay until it had been printed and distributed, and upon his motion the thanks of the Institute were tendered the gentlemen who had so kindly acted as judges. The envelope bearing the motto designated was then opened, and the name of the successful competitor announced.

THE NAVAL POLICY OF THE UNITED STATES.

BY LIEUTENANT CHARLES BELKNAP, U. S. N.

"*Sat cito, si sat bene.*"

I.

The extraordinary attention paid of late years by the leading powers of the world to the condition and efficiency of their navies leads to a belief that there is a growing tendency to greater reliance than heretofore, in case of war, upon this arm of a country's defence. It is not only among the leading powers of Europe that this change is taking place, it has spread to South America; and even in China and Japan, the navy appears to be the main weapon for offence or defence.

Under such circumstances, and when we find it commonly believed abroad that the United States was compelled to acquiesce in the demands of the Spanish Government for the settlement of the Virginius affair, on account of its inability to cope with the Spanish naval force of seven armored vessels, it is well to inquire into the condition of our own Navy, and to suggest such changes in our naval policy as will best tend to the proper development of our naval strength, in order that our again being placed in such a false position before the eyes of the world may be prevented.

In treating such a subject, the question naturally arises, Is there any necessity for the maintenance of a strong naval force by the United States? At first sight, separated as the country is by its geographical position from the rest of the world, and freed by its state policy from foreign complications, the maintenance of a powerful Navy seems an useless expense. And, moreover, objection has been made on the score of the consequent danger to the national independence. In the words of the talented historian of the United States Navy, "In a democracy there exists a standing necessity for reducing everything to the average comprehension, the high intelligence of a nation usually conceding as much to ignorance as it imparts. One of the worst consequences, in a practical sense, of this compromise of knowledge is to be found in the want of establishments that require foresight and liberality to be well managed, for the history of every democracy

has shown that it has been deficient in the wisdom which is dependent on those expenditures that foster true economy by anticipating evils and avoid the waste of precipitation, want of system, and a want of knowledge." And I believe the latter objection is advanced rather as an excuse by the high intelligence of the nation for its concession to ignorance than as a real reason for the policy of neglect so long observed towards the Navy. Rejecting, then, this objection as barely worth noticing I will venture to state what seem to me ample reasons for the maintenance of a strong naval force by the United States.

The necessity for the display of a naval force can never be foretold. The navies are the police of the world at large, and events are constantly happening where peace and good order are best maintained by instantaneous and determined naval intervention. Instances will undoubtedly present themselves to every one, but I may be permitted to refer to a few. The prompt action of Capt. Ingraham, of the U. S. S. St. Louis, at Smyrna, in 1853, in regard to Martin Kozsta, emphasized the determination of the United States to defend the rights of its adopted citizens abroad; and that it prevented, to a great extent, future complications on the same account is more than probable. The subsequent voting by Congress of a gold medal to Capt. Ingraham is sufficient proof that the Government will always appreciate the conduct of an officer who acts fearlessly upon his own responsibility where the honor of his country is involved. United States vessels have frequently interfered for the protection of life and property and the preservation of order, when the local authorities have been powerless, in Honolulu and in Panama. For the same reason, the Spanish iron-clads, in the hands of a piratical rabble from Carthagena, were seized by the English fleet and turned over to the proper authorities. The opportune appearance of the U. S. S. Adams saved a Chilian colony from pillage and destruction, and the arrival of an English gunboat put an end to the merciless slaughter of the Virginius prisoners at Santiago de Cuba. Many more cases might be cited, but these few selected at random will, I think, prove that the necessity for the employment of a naval force is most pressing when least apprehended.

That commercial and naval supremacy are coexistent is undeniable. The great commercial power of the world has always, for the time being, been also the great naval power, and history teaches us that when the naval supremacy of a nation has been overthrown the decay of its commerce has followed as an inevitable result. For a period of some forty years preceding the breaking out of the late rebellion, the skill

of our ship builders and the wise administration of the scanty funds appropriated by Congress for the use of the navy furnished us with a few specimens of naval architecture unsurpassed by any in the world. During the same time our merchant marine bade fair to wrest the lion's share of the carrying trade of the world from the hands of our great commercial rival. The war that followed offered an opportunity for the destruction of our merchant marine, which was not neglected. Privateers fitted out by our generous rival, on behalf, and sailing under the flag of the Southern States, pounced upon their unprotected prey, and the question of commercial supremacy was settled, for a half century at least. By an experiment at Hampton roads, in 1862, the war settled another question,—that naval architecture was revolutionized. Since then the Government has, in its naval policy, slept the sleep of a Rip Van Winkle, and now, awakening, it vainly endeavors to answer the demands of the present age with a navy suitable to the wants of a past generation. Our share of the carrying trade of the world is lost, and until we show ourselves strong enough to protect it, we may rest assured it will not be regained. The increasing influence of the agricultural and mining interests of the West in our national councils, and the disregard paid to the commercial interests of the East; the spread of the use of iron and of steam in merchant vessels; the sharp competition by numerous and heretofore unheard of rivals; all these reasons may be advanced for the decline of our commerce, but I hold that the inability of our Navy, on account of the inadequacy of its force, to protect the merchant vessels sailing under its colors, was the chief cause of capital's seeking safety under other flags.

Intimately connected with this is the influence exerted by a strong naval force upon nations having no merchant marine of their own, and especially upon those which are commonly, though not always with justice, termed semi-civilized. The commerce of the Pacific Ocean which lies along such a vast extent of our western coast, naturally should be ours, and in the same manner it might be expected that intimate commercial relations would exist between us and the two great Eastern Empires. But despite our proximity the United States flag is rarely seen off our western coast, and our trade with China and Japan is barely enough to employ two lines of steamships, sailing triweekly. And one of these lines even is under a foreign flag. The reason for this lack of intercommunication is evident. The mind of the oriental is influenced, not by theories, but by facts, and, though

the United States Government may be respected and esteemed for its policy of non-intervention, if not of sympathy, trade is gained and influence exerted in China and Japan by the nations keeping a powerful naval force on their coasts. I am strongly of the opinion that, incidentally, the restoration by the United States of indemnity funds unjustly exacted from those countries and, particularly, the maintenance in those seas of a large naval force authorized to lend its moral support to prevent the bullyings they are constantly subjected to, would do more to restore American commercial interests in that quarter of the globe than would the removal of any of the existing restrictions upon commerce that might be suggested.

The recent suggestion made by one foreign government that it might under certain contingencies interfere in the existing war between the South American republics, and the attempt about to be made, under the auspices of another, to build a canal across the Isthmus of Panama, recall to mind a state policy formally announced in 1823, and commonly known as the 'Monroe Doctrine.' By the moral force of that doctrine the Spanish Colonies of Central and South America were materially aided in gaining, and have since been enabled to retain their independence. The withdrawal of the French troops from Mexico and the subsequent downfall of the mimic empire erected by the government of Napoleon III. at a period when internal dissensions threatened the permanent disruption of the power which promulgated that doctrine, were caused by a reassertion of its principles, after the war, by the late Mr. Seward, at that time Secretary of State. Can it be that the Monroe Doctrine, so intimately allied to the foreign policy of the United States, though apparently well-nigh forgotten, is to be allowed to sink into utter oblivion? Are we prepared, in contravention of its principles, to allow one foreign power to interfere for the avowed purpose of humanity between combatants on this continent; and another to assume control of a canal, the unfriendly possession of which would be a standing menace in time of war? We cannot be so lost to the dictates of humanity that we do not care, at the proper time, to offer our intervention for the purpose of preventing the further useless waste of blood and treasure. We certainly are more interested than any other nation in the completion and control of an inter-oceanic canal, and, if it be demanded by the commercial necessities of the present age, we ought not permit any nation to forestall us in an enterprise of such vital influence upon our future welfare. I believe that free and extended discussion upon these subjects would

show that the American people as a unit demand the rigid maintenance of the principles of the Monroe Doctrine. Yet to be able to do this effectively a navy must be maintained, and I need not say that by a navy I mean something more than what we now possess under that name. Under the present circumstances, we are likely to see the principles of non-intervention by any foreign nation in the affairs of the American continent, a policy we have never disavowed, violated at any moment, in contempt of our views, by some strong naval power whose interest conflicts with our own. With what heart then could the Secretary of State protest against foreign encroachments, well knowing he had no force behind him to rely upon when protest failed? If the present penny-wise policy in regard to the Navy is to be continued, it would perhaps be preferable, while we could, not quite disgracefully, to withdraw from the stand taken, and in that way avoid possible disagreeable complications with a power possessing half a score armored sea-going vessels. For such action we have, unfortunately, precedent in the most extraordinary policy pursued by the Government in the early part of the century, when, with a foreign trade that employed over half a million tons native shipping, Congress, for the declared purpose of preventing it from being subjected to depredations by the belligerent powers of Europe, passed a law forbidding any vessels to leave port for any foreign country! The idea of protecting our shipping by means of a strong naval force seems to have been unthought of.

If then a strong navy be desirable in time of peace, how much more so is it in time of war. Our early experience should teach us that the proper observance of the rights of a neutral can only be forced upon the belligerents by the presence of a powerful naval force. It is extremely doubtful if either the French or English government would have become involved in hostilities with the United States had the latter, by maintaining a navy worthy of the name, showed a determination to protect itself. And would it not have been truer economy to have been so strong upon the sea as to have avoided the war with France, in 1798, and the war with England, in 1812, and the consequent expenditure of so many lives and so much money? Moreover it is extremely probable that, in any future war which may arise between the maritime powers of Europe, the first and second articles of the treaty of Paris, in 1856, will be annulled. These articles abolished privateering, and declared that the flag of a neutral protected enemy's goods, with the exception of contraband of war, from cap-

ture. Belligerent nations, their own shipping being liable to capture, will be forced to take this step to prevent their carrying trade passing into the hands of the neutral powers. At present, a very large percentage of our exports is shipped to Europe in foreign bottoms. A war breaking out there would throw the principal part of this to us, as being neutral, provided we showed ourselves willing and able to protect our ships from illegal exactions and capture. The embargo act of 1807 could hardly be repeated in 1880, and the other alternative would be to strengthen the Navy; but if we begin to make preparations during a foreign war, and any preparation in the present state of our Navy would be extraordinary, it would very likely, if not considered a *casus belli* by one of the combatants, be thought unfriendly at least, and apt to give rise to future unfriendly relations. In the hopes, then, of regaining our own carrying trade at the earliest opportunity, we ought to maintain such a naval force that, upon the breaking out of war between foreign nations, we should be able, without extraordinary exertions, to send enough men-of-war to act as convoys to our merchant vessels in all parts of the world. And by doing this, in addition to the advantage gained from announcing our intentions beforehand, we would have the satisfaction of knowing that we were at the same time providing the best safeguard against a repetition of the difficulties which led to the wars of 1798 and 1812.

In fine, though I cannot claim to have exhausted the subject, I trust I have said enough to show that the unsettled condition of society in the less civilized parts of the world; the depressed state of our maritime interests; the enforcement of the principles of the Monroe Doctrine and of our neutral rights, all demand the maintenance of a strong naval force, and I now purpose inquiring to what extent the present force maintained by the United States answers to that description.

II.

It may be gathered from my preceding remarks that I do not consider the present condition of the matériel of the Navy one from the contemplation of which much satisfaction can be derived. Even the Honorable Secretary of the Navy, who, from his office, is expected to view all naval short-comings through a roseate atmosphere, says in his last annual report, "The largest part of the Navy, however, is composed of vessels of the old types, and while some of them possess excellent qualities and are equal to any in the world, of the same types,

yet the Navy as a whole cannot be brought up to the modern standard of naval architecture until we shall avail ourselves of existing improvements."

The men-of-war of the present day are so far superior to those of the last century that it is scarcely to be doubted that two or three of them could defy the combined navies that fought under and against Nelson. In fact, owing to the increased power of manœuvring due to the introduction of the twin screw; to the greater resistance to projectiles on account of the increased thickness of the armor in which they are clad; and to the enormously increased range and destructive power of the ordnance they carry, the development, since the first were built twenty years ago, has been wonderful. A swift, armored ship, with heavy guns and skilful gunners, is nearly the equal if not the superior of the fort, which affords a stationary target, and moreover some of the recently constructed foreign men-of-war are to carry heavier guns than are mounted in any fort in the world.

Let us suppose now that the United States should become a belligerent, and the record of the few past years shows that this is by no means an impossible hypothesis. In such a case the war would necessarily at first be carried on at sea. And here let me say, that for some reasons, I think the part which the Navy took in the late war between the Northern and Southern states, though so highly creditable to the skill and courage of the personnel, was perhaps as great a misfortune as could have befallen it: for the nation generally is firmly persuaded that it has at any time like Glendower but to call spirits from the vasty deep, and a navy will appear. It is perhaps unnecessary to point out that the Southern states had no navy and that in any foreign war in which the United States might become involved, the conditions would be entirely different. The construction of armored sea-going men-of-war, requires in addition to time, skilled workmen, and larger rolling mills than are now to be found in the United States; and, besides, the modern men-of-war are so different from those we now possess, both in management and in the ordnance they carry, that long practice would be required before they could be skillfully manœuvred, and careful training would be necessary to prevent the mechanism of the guns and carriages becoming disabled, in the haste and excitement of action, by the manipulation of inexperienced gunners. Notwithstanding these considerations, we go on year after year, blindly trusting our naval defences to a navy, "the largest part of which is composed of vessels of the old types"!

The non-professional enquirer, upon learning that there are one hundred and forty two vessels composing the Navy of the United States, is apt to be too easily deceived by the figures. Let us look over the list, and, striking off those which are virtually worthless for war purposes, find out what really constitutes our naval force. In the first place twenty seven tugs and twenty two sailing vessels must be deducted from the one hundred and forty two, leaving ninety three to be accounted for. Of these ninety three, sixty seven are steamers of all classes, twenty four are iron-clad batteries or monitors, and two are torpedo boats. Of the sixty seven steamers, four are on the stocks, never having been launched, eight are old paddle wheel boats, seventeen of various classes are in different stages of decay, but principally so rotten as to be unworthy of repair, one is a tug converted into a gunboat and another is a despatch vessel; all of which should be deducted, leaving thirty six. Out of these thirty six, a dozen or so might be picked which have sufficient speed to overhaul an ordinary merchant steamer; the remainder are too slow to run away and too lightly armed to defend themselves should they fall in with a man-of-war of the improved type belonging to an enemy. Of the twenty four iron-clad batteries three are said to be on the stocks, but I believe they either have been or are about to be broken up; one, the Roanoke, is utterly worthless, and, though borne upon the register, is commonly believed to have been broken up by a former secretary of the Navy; one, the Puritan, has never been finished, and five are undergoing repairs which require considerable time and expense for completion. Excluding the two torpedo boats as being simply experiments, and including the five monitors undergoing repairs, we have nineteen iron-clad vessels to be added to the thirty six wooden steamers, making the total force amount to fifty five vessels. I need hardly say that in speed, with one or two exceptions, in ease of manœuvring, in thickness of armor plating, and in weight and penetrating power of projectiles, all these monitors are far surpassed by the more modern type of sea-going armored vessels, and their main reliance in time of action would be upon the small target they would present, and upon the hope of a chance shot crippling in some way their more powerful adversaries whose armor they could not penetrate.

We have then the astonishing spectacle of a nation of fifty millions of inhabitants, occupying a position midway between the two great centres of population of the world, with a commerce that needs the electrifying influence of a powerful navy to stimulate it, with a policy

of non-intervention in the affairs of its continent by foreign nations, and with an enormous coast line and innumerable ports to be protected, relying for its defence upon the navy I have described, which, whatever may have been its value twenty years ago, is to-day, on account of the inferiority of its ships and ordnance, barely noticed in calculations in regard to the relative strength of the navies of the world. The peaceful dissipation of the threatening clouds that have from time to time obscured our political horizon has given rise to a widely spread optimism in regard to our future welfare; but is there no danger in trusting too much to the manifest destiny of the Republic? Will nothing but the quickening effect of a heavy war indemnity awaken us to the necessity of maintaining our national defences in a high state of efficiency?

III.

Of the claims of the Navy upon the people of the United States, I need hardly speak; the recital of its deeds forms some of the most brilliant pages of our country's record, yet, as we review the treatment the Navy has received, we find its history presents an almost continual struggle for existence. One of the necessary concomitants to the contests of political parties in the United States seems to be a demand for economy in the expenses of the Government, especially after any period when extraneous troubles have materially increased the national expenditures. This cry for economy has generally been satisfied by the decimation of the very branches of service upon which the country relied for its preservation and defence. Thus, every time that there has been occasion for the employment of a naval force, it has been necessary to create it, using the small nucleus regularly maintained as a leaven to the mass. The necessity past, the additional force has been discharged, the material purchased has been either sold at a great sacrifice or allowed to fall into decay, and the normal state of *res angusta domi* has resumed its sway in naval affairs.

But apart from this there is, I think, another reason for the illiberal policy shown towards the Navy. Evidences are not wanting that upon several occasions of late, the national legislature would have been willing to make ample appropriations for the purpose of increasing the efficiency of the Navy had they been persuaded that a fixed policy would be adopted which would bring about the desired result. Or, to give expression to the idea, it seems to have been about as fol-

lows: "If you, officers of the Navy, can agree upon some settled policy which will best tend to the development of our naval strength, we, members of the naval committees of Congress, shall not be found wanting in the proper spirit to aid you to accomplish the effect." The lack of unity shown in the recommendations of the multiplicity of advisers has succeeded in so bewildering the members of the committees that, Micawber like, they have postponed all action from session to session in the hopes that something would turn up. On account of this, and in order that a definite naval policy may be adopted, which the Bureau system seems to have failed to accomplish, I venture to recommend the reëstablishment of a Board of Naval Inspectors, or Commissioners.

Naval operations during the Revolutionary war were naturally of an isolated and desultory character, and the small naval force formed was disbanded upon the conclusion of peace. From that time until 1798, the direction of such naval operations as became necessary was entrusted to the War Department. Despite the creation of a separate department for the management of affairs of the Navy, in 1798, the war of 1812 found the country almost wholly unprepared for sea warfare, and it was not until the Navy had shown itself by several brilliant actions worthy of trust that Congress was induced to grant appropriations for increasing its efficiency. Nevertheless, the preparations came too late, and the close of the war found the Navy driven from the sea, its ships captured, destroyed, or blockaded by overwhelmingly superior forces of the enemy. The wisdom of entrusting the direction of a navy to officers, fitted by profession and experience to judge of its requirments, became so apparent that, in 1815, Congress created a Board of Inspectors, three in number, which, under the superintendency of the Secretary of the Navy, was charged with all the duties of the department relating to the collection of materials and supplies, and to the construction, equipment, armament, and employment of vessels. There was no rotation in office, the naval committee of the House of Representatives, rejecting a proposal to that effect, in 1820, on the ground that it would prevent "securing the accumulating experience and talent of our naval commanders." The success of the management of naval matters by this Board soon became apparent, and the Navy attained a state of discipline and efficiency which, perhaps, has never been surpassed. In 1842, however, the Board of Inspectors was merged into the present bureau system. The increasing business of the Navy Department may have rendered imperative the establish-

ment of sub-departments for the proper consideration of matters coming under its cognizance, but there was no call for the abolition of the Board of Inspectors, and the wisdom of the step taken is questionable. As a result, we have, to-day, seven separate and distinct bureaus, each working independently, and following out the ideas of its own head without regard to the plans of the others. The lack of unity consequent to this arrangement, and the necessity for a superior controlling power, have on many occasions been only too obvious.

I recommend, therefore, that a board of commissioners be established as an Advisory Board to the Secretary of the Navy. At the same time the Secretary of the Navy should be given a seat in each House of Congress; in either of which he could, when necessary, appear personally to answer interrogatories in regard to the Navy, and to propose, explain, and advocate measures calculated to increase its efficiency. By this arrangement, the Secretary of the Navy, who is not, ordinarily, conversant with the details of the Naval Service, would have a board of officers, selected for their professional attainments, ready at any moment to give him the benefit of their knowledge and experience; while the Navy would have, what it so greatly needs, a statesman, eloquent and ready in debate, to defend it in the Houses of Congress against the attacks of unwise economy, and to advocate those measures upon which its future welfare depended. The Board should be composed of the senior admiral on the navy list, presiding officer ex officio, and of two other officers, of a grade not lower in rank than commodore, to be selected by the Secretary of the Navy and appointed by the President. The Board should have the power of selecting, as secretary, an officer of a grade not lower than commander. It should hold its meetings at Washington unless otherwise directed by the Secretary of the Navy and the members and secretary should be entitled to the sea pay of their grades. The evils inherent to the bureau system being now counteracted, the Bureaus should be maintained and the chiefs should be held responsible for the economical and thorough execution of such work as would be entrusted to them. The Board should have power to call upon the chiefs of bureaus for the information they naturally as specialists would collect.

After such a long period of inactivity, our policy should be to advance as rapidly as consistent with safety. Radical changes, except where necessary for the cure of existing evils, should be avoided. The conservatism natural to a board constituted as I have recommended would prevent too much innovation on the one hand, and attain increased

efficiency on the other. Appropriations should be husbanded, and unexpended balances at the end of the year should be turned not into the treasury as at present, but over to a general construction fund, which should also receive the sums accruing from the sale of condemned stores and vessels. The attention of the Board should at first be given to determining the best means for satisfying our requirements, (1) for the naval defence of our coasts and sea ports; (2) for the protection of our commerce and the destruction of an enemy's; (3) for the destruction or capture of the men-of-war of an enemy; (4) for carrying the war into an enemy's country.

(1) The determination of the best means of defending our coasts and seaports would involve a thorough course of experiment and investigation in regard to torpedoes, steam rams, and floating batteries. Officers of the line, stationed at or in the neighborhood of the different naval stations, should be required to thoroughly acquaint themselves with the approaches from seawards, and to suggest the most advantageous positions for the placing of sub-marine mines and torpedoes, and for the concentration of the means of naval defense; in fact they should be expected to prepare careful plans for the defence of the naval stations and the adjoining seaports. In this connection, I would recommend that no officer of the line, be promoted to the grade of lieutenant until he has passed through the course of instruction at the torpedo school; and, after the lapse of a suitable time, the same restriction should apply to those now occupying the grades of lieutenant, lieutenant-commander, and commander.

(2) Enquiries as to the best means of protecting our commerce, and destroying an enemy's, would involve the selection of the best type of a vessel for a cruiser, which would combine speed with economy of fuel and at the same time carry a sufficiently powerful battery to defend itself against the corresponding class of an enemy's vessels. Also the methods of convoy sailing, and the points to which cruisers should be despatched upon the declaration of war, for the purpose of capturing an enemy's merchant vessels, should be discussed. Lists of merchant vessels capable of being converted into swift, light-armed cruisers should be kept. As coal in time of war is virtually contraband of war, the question of coal supply and coaling stations would be a necessary adjunct.

(3) By far the most important question to be decided by the Advisory Board would, however, be the selection of a model for the construction of an offensive, sea-going, armored man-of-war. Upon this

point there is such a conflict of opinion, some eminent authorities claiming the superiority of topedoes over iron clads, others as strenuously advocating the claims of the steam ram, that only after careful and patient investigation, and calm and mature deliberation could a decision be arrived at. The rival claims of torpedo, ram, and iron-clad would first be considered; and if, as I think, the palm were awarded to the iron-clad, the questions of iron-clad ship construction and of armor plating, the material, the manner of fastening, the angular inclination, the thickness of plates and their manufacture;—these questions and many more, intimately allied, would require careful reflection. The kind of gun, ammunition, and projectile, the style of carriage, and the manner of delivering the fire would require a continued series of experiments before determination.

For the purpose of encouraging discussion and stimulating enquiry, the Advisory Board should be empowered to offer, annually, or even semi-annually, suitable rewards for prize essays upon these and other subjects so intimately connected with the future of the Navy.

The experiences of the leading naval powers of Europe for the last fifteen or twenty years in the construction of armored men-of-war, and the series of experiments in the contest between guns and armor, though by no means ended, would materially aid us in arriving at satisfactory conclusions. And I recommend the appointment of a naval officer, as naval attachè to each of the legations maintained by the United States in Europe, in order that we may obtain early and trustworthy information in regard to all matters going on of interest to the naval service. The officers to be selected for this important duty should have, in addition to the special qualifications of suitable rank and of familiarity with European languages, professional attainments of a high order. They should take advantage of every opportunity offered to make themselves acquainted with the naval strength of the country to which they are accredited and with the details of all experiments in which naval materials or implements are concerned, embodying the results of their observations in confidential reports to the Advisory Board.

(4) The custom of imposing heavy war indemnities upon the conquered combatant seems to have become prevalent of late years in Europe; and, consequently, the immense advantage to be derived from the occupation of a portion of an enemy's country as a pledge for payment, can be readily seen. Plans of naval campaigns should then be prepared, involving combined naval and military operations against assailable portions of an enemy's territory. Lists of merchant vessels

capable of conversion into transports should be made and constantly corrected, and the manner of marine counter-mining and of removing torpedo obstructions should be thoroughly discussed. In addition, officers on foreign stations should be required to thoroughly familiarize themselves with the approaches to the various ports visited, their means of defence, and the best positions to be occupied as points d'appui for operations against the surrounding country.

In addition to determining a policy to be followed by the United States in regard to these most vital questions, the attention of the Advisory Board might be turned with advantage to the consideration of matters of minor importance. The Board should require careful estimates for the repairs of naval vessels and in any case where the cost of such repairs would exceed one half the original cost of the vessel, the vessel should be broken up or sold, and the proceeds devoted to the fund above mentioned.

The uniform for the officers and men of the Navy as now established should not be changed except by Act of Congress, upon recommendation of the Advisory Board. With such a law in force, the body of officers and men composing the Navy would not be compelled to make a change in their uniform, unless the advantages to be gained therefrom were greater than the satisfying of a caprice of a few individuals.

Again, the Advisory Board, after a careful consideration of the laws passed by Congress, should compile a complete system of rules and regulations for the government and discipline of the Navy of the United States. The want of harmony at present existing among the different branches of the naval service is well known, and that it detracts from the efficiency of the Navy as a whole, is undeniable. This lack of concord so necessary to the prompt and efficient execution of duty is partly due to the existing ill-digested and self-conflicting set of rules and regulations by which the Navy is governed, but more so to the evils arising from special legislation by Congress. All special legislation in regard to individuals, and branches of the Navy should be stopped and no such bills should be considered by the Naval Committees of Congress except upon the favorable recommendation of the Advisory Board, or, failing that, of the Court of Claims. The rights and duties of all officers and men being, then, clearly defined by law, and the hopes of individuals or branches of selfishly gaining advantages over others, by special legislation, being cut off, the former harmony which

existed among the various branches of the Navy would be restored and the efficiency increased in a corresponding degree.

To briefly summarize, the first step in the future Naval Policy of the United States should be the establishment of a Board of Naval Officers, which, under the supervision and direction of the Secretary of the Navy should consider and determine :—

(1) All plans for the construction, alteration, repairs, equipment, and armament of the vessels of the Navy.

(2) A system of rules and regulations for the government and discipline of the Navy.

(3) Plans for naval campaigns, both offensive and defensive.

(4) Minor matters affecting the welfare of the officers and men of the Navy; and all claims requiring legislation for the benefit of individuals or branches of the Naval service.

They should also collect and compile, ready for reference :—

(1) Information in regard to the naval strength of foreign nations.

(2) Lists of merchant vessels suitable for transport service, or for conversion into light-armed cruisers for destroying an enemy's commerce.

(3) The number and capacity of private ship-building yards, iron-works, and rolling mills.

(4) And any other information likely to be serviceable in time of war.

The question of promotion is always, in time of peace, one difficult of solution. The many years that must pass before the casualties incidental to the service enable a young officer to gain his promotion are apt to deaden the ambition which should urge him to keep abreast the wave of advancement which appears to be sweeping over the present era. As an incentive to emulation and self-improvement, I venture to recommend that the present system of promotion by seniority be so far modified as to allow every third promotion to a grade to be made by selection from the officers, having a required amount of sea service, in the grade next below that in which the vacancy occurs. Again, this would in a few years enable the selection of two members of the Advisory Board to be made from officers who had advanced themselves by constant application and by devotion to the details of their profession. In order, however, to make vacancies on the active list, I recommend that officers be permitted to retire, at any time after ten years sea service and a course of instruction at the torpedo school, upon half pay. A number would annually avail themselves

of this privilege; promotion would be more rapid, and a Naval Reserve would be formed upon which the Government could in case of emergency rely for service afloat or for torpedo duty ashore.

For want of other employment, warrant officers are frequently detailed for duty on board vessels already too cramped for the proper accomodation of their crews. From causes too obvious to mention, the man-of-war of the present age is so different from that of last century, that the necessity for the retention in the service of the grades of boatswain, sailmaker, and carpenter, no longer exists. These grades should, then, be allowed to lapse by not making any appointments to fill vacancies. The care of the battery and small arms of a vessel alone being of sufficient importance to require the services of a warrant officer, the grade of gunner should be retained, and all applicants for the position should be required to pass a thorough examination to prove that they have sufficient intelligence and capacity to understand the mechanism, and to take the proper care for the preservation of the improved weapons now in use. By thus dispensing with the services of these one hundred and forty two superfluous officers, a sum sufficient for the pay and maintenance of over six hundred men would annually be gained.

The difficulty of obtaining seamen to man our vessels, during the late war, was seriously felt. We cannot rely upon merchant seamen, for the class has through so many causes become so deteriorated as to be generally worthless; and so large a proportion are foreigners that they cannot be depended upon to fight for the country that employs them. While the raw recruit may in a comparatively short time be converted into the disciplined soldier, the sailor is made only from the boy. The number of training ships should be increased and twenty five hundred boys, at least, enlisted in addition to the regular complement of the Navy. Each man-of-war going into commission should take a certain proportion of her crew from the boys on board the training ships who have shown most aptitude for a sea life. In this way a reserve of seamen would gradually be formed, for although these boys after the first cruise might not remain in the Navy, in case of war they would naturally gravitate to the service in which they were educated.

During time of peace, the navy yards might with advantage be reduced to four; three, New York, Norfolk, and Pensacola, on the Atlantic coast, and one, Mare Island, on the Pacific; with a fresh water basin for iron vessels. But, as the extent of our territory would render the yards closed very valuable in time of war, sufficient money should be

annually appropriated to keep them from deterioration. In this connection, I would recommend that the complete control of the navy yards, even to the exclusion of local politicians, should be by law given to the naval officers in charge. The officers might then be held strictly accountable for the work done, and the spectacle of a large increase of the working force prior to elections and the discharge immediately after, happily not visible during the present administration, but so common in former days, would be avoided.

With these few suggestions I bring my remarks to an end. I have shown that the United States does not possess a navy commensurate with its wants, and I have pointed out what I believe to be the best way of properly developing our naval strength. But, after all, it is Congress which decides the naval policy of the country, and it is to Congress therefore, that we must look for the means to accomplish our end. The recommendations I have made apply equally well, in event of the continuation of the present economical policy towards the navy, or should Congress determine that the time had come to again strive to be foremost in the struggle for the commercial supremacy of the world. Sooner or later the day will come when the nation will again enter the arena; let us then endeavor to be so prepared that in the heat of the strife we may not be disheartened by a discovery of fatal weakness in our trusted weapons.

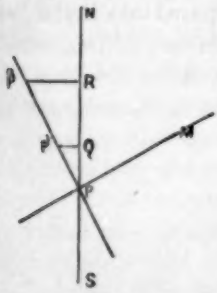
December, 1879.

PROFESSIONAL NOTES.

These Articles have not been read before the Institute, but are inserted by direction of the Executive Committee.

To Determine by the Aid of Azimuth Tables the Effect upon the Longitude of a Change in the Latitude Used in Working a Time Sight.

Proposition. The departure due to a change of one minute in the latitude used in working a time sight is the tangent of the difference between 90° and the azimuth of the body observed.



Let P be the position whose longitude has been computed with the assumed latitude. N S is the meridian through P. M is the body observed, and N P M is its azimuth. P P′ P″ is the line of position perpendicular to P M. The angle N P P″ is the difference between 90° and the azimuth. Let P′ be a point on the line of position whose latitude is one minute greater than that of P. The departure due to this change of latitude is P′Q. The tangent of NPP″ is $\frac{QP'}{QP}=QP'$, since QP is, by hypothesis, equal to one. Therefore QP′, or the departure due to a change of one minute in the latitude, is the tangent of the difference between 90° and the azimuth.

Suppose P″ to be a point on the line whose latitude is a minutes greater than that of P. Then $RP'' = QP' \times a$, or the departure for any change of latitude is equal to the departure for one minute multiplied by the number of minutes.

The error due to the assumption that RPP″ is a plane triangle is not appreciable for ordinary purposes.

The annexed table is formed by changing the natural tangents from decimals of a minute into seconds.

TO MAKE USE OF THE METHOD.

TABLE.

Azimuth. ∠ 90°	Departure.	Azimuth ∠ 90°	Departure.
1°	1″	31°	36″
2	2	32	37
3	3	33	39
4	4	34	40
5	5	35	42
6	6	36	43
7	7	37	45
8	8	38	47
9	10	39	49
10	11	40	51
11	12	41	53
12	13	42	54
13	14	43	56
14	15	44	58
15	16	45	60
16	17	46	62
17	18	47	64
18	19	48	67
19	21	49	69
20	22	50	71
21	23	51	74
22	24	52	77
23	25	53	80
24	27	54	83
25	28	55	86
26	29	56	89
27	31	57	92
28	32	58	96
29	33	59	100
30	35	60	104

The time sight being worked out, enter the azimuth table with the latitude and declination used and the apparent time, or hour angle, computed, and take out the azimuth corresponding. With the difference between this and 90° enter the table given and take out the departure for one minute in seconds of arc. With this departure and the latitude enter the traverse table and take out the corresponding difference of longitude. Multiply this by the number of minutes of change in latitude, and the result is the required difference of longitude. The sign of application of this correction to the longitude computed, may be readily determined by a consideration of the direction of the line of position.

EXAMPLE.

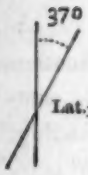
At Sea, 8.30 A. M., Sunday, 21st Dec., 1879,
Latitude 15° 47′ N. I. C. 0

	h.	m.	s.
C.	12	25	04
W.	8	20	00
C.—W.	4	05	04
W.	8	27	28
C.	12	32	32
C. C.		2	27
G. M. T.	12	34	59
	—11ʰ.	4	

⊙'s Dec. S. 23° 27′ 12″ + 1″. 0 H.D.
12 —11 4
P.D. 113 27 00

Eq. T. 1ᵐ. 47ˢ.— 1ˢ. 2 H.D.
14 —11 4
2 01 13 2
5
13 7

⊙	25°	50′	20″		
		10	10		
	26	00	30		
	15	47	00	10.01669	
	113	27	00	10.03744	
	155	14	30		
	77	37	15	9.33119	S.D. 16′ 16″
	51	36	45	9.89423	Par. 08
				19.27955	Dip.— 4 14
				9.63978	Ref.— 2 00
					10 10



App. T.	8ʰ.	33ᵐ.	03ˢ.
E.T.		2	01
L.M.T.	8	31	02
G.M.T.	12	34	59

Long. 7ʰ. 56ᵐ. 03ˢ.=119° 00′ 45″ E.

Entering the azimuth table with Lat. 16° N., Dec. 23°, 27′ S. App. T. 8.ʰ 33ᵐ, we find the azimuth to be N. 127° E. Entering the given table with 37° the departure corresponding, for one minute of latitude, is 45.″

From traverse table, with Lat. 16°, the corresponding D Long. is 47.″ The sign of application is evident from sketch of line of position.

The position at 8.30 A. M., carried forward to noon, gave 15° 35′ N. 119° 09′ 45″E, but observation at noon determined latitude to be 15° 45′ N; therefore true longitude at noon was 119° 09′, 45″ E + 47″ × 10 = 119° 17′ 35″ E.

The method has the advantage of enabling the Navigator to correct his position at noon instantly for any difference between the latitude by observation and dead reckoning, the error for one minute having been determined at the time of working the morning sight. It also enables the second point of the Summer line to be readily determined for the sun or any other body whose declination falls within the limits for which the azimuth tables have been computed.

The use of the method gives the Navigator a clear idea of the value of a sight without the necessity of plotting the line of position, and suggests the ease with which he may, when uncertain of his latitude, find from the tables the time of crossing the prime vertical, and take his sight at, or near, that time.

C. S. SPERRY, Lieut. U. S. N.

DEVICES FOR LESSENING THE DANGERS OF THE SEA.

To the Cor. Secretary of the Boston Branch of the U. S. Naval Institute.

I beg leave to call your attention to certain devices for lessening the dangers of the sea, which, though not new, it may be well to discuss in these times when collisions at sea and along shore follow in quick succession. I have deposited at the Naval Lyceum a rough model made by my unskilled hands of a boat and davit, such as I put upon the Meteor in 1865, and which worked satisfactorily; it will be seen that it consists of two solid stanchions bolted to the side of a ship, to which are attached two flat iron davits or "dericks," connected by a spar to which the boat is hung by tackles as usual; these davits are steadied by permanent guys leading fore and set up in line with the foot of the davits, so that there is no necessity for coming-up the guys in swinging the boat in and out.

The Boat can be secured in three positions; first, ready to lower clear of the side; secondly, stowed over the gunwale or hammock netting, and last, inboard, ready to be stowed in chocks as in a vessel with a hurricane deck, or kept suspended inboard in a vessel with an open deck. It will be observed that the tackle falls by which the boat is hoisted and lowered, pass through a leader near the foot of the davit, so that, when made fast, there will be no movement of the boat in a vertical line by the slacking or tautening of the tackles when she is swung out or in; it will also be noticed that there are two tackles attached to a short chain passing through a fixed leader on the head of the stanchions; the object of these tackles is not to pull in the davit and boat when suspended outboard, but merely to take in the slack of the chain as the davit comes in, and, on the other hand, to ease her down to the stowing point in suspension—or into chocks.

In an arrangement for a large boat these pennants may be of chain, or of supple wire rope; the davit is to be kept from going too far out or too far inboard, by a toggle or other device near the upper end of the tackle block. The intention is to swing the boat in by a pennant or tackle at the end of each davit leading across the deck; the amount of purchase necessary to accomplish this, must of course depend on the weight of the boat and the number of hands available for the work; for the boat of a small yacht, it will only be necessary to pull her in and ease her out by hand; but for a heavy boat a tackle or at least a

whip will be necessary. When the boat is to be stowed in the upright position over the gunwale, a pin passing through the stanchion and the bar davit secures her there; for a large boat chocks on the rail or gunwale to land her in will be useful if not necessary. If, as in some vessels of war, a light boat is to be hung on the same davit as a cutter, it will be necessary to elongate the bar davit, curve it outward a little, and place a light spar fore and aft, as in the case of the other boat; but, for steamers carrying passengers, and for merchant vessels, two boats hung to one davit will not be proper. This arrangement, while well adapted to war ships, is more specially devised and recommended for passenger vessels and most especially for such steamers as navigate our sounds and rivers, where in general there are few expert, well drilled seamen to manage. It is an excellent plan for the smallest yacht. In examining my rough model on so small a scale it will be necessary for you to make some allowances for my imperfect mechanism. The common crooked davit is open to several objections, one of which is often mitigated by causing the davit to swing in and out through a projecting clamp with pins and holes to confine the davit in the position to lower the boat, and also to keep it upright near the side of the ship still the fore and aft guys and the Toppinglifts must be tended.

My opinion (perhaps worth very little for a man-o-war) is that no boat davit should depend much on any attachments by lifts to the vibrating masts; but that each davit should depend for its integrity on the fixtures to the hull of the ship instead of placing boats abreast of the rigging in order to avail ourselves of lifts leading to the masts. I prefer to place my boats where there is nothing to prevent swinging them directly in board, and if necessary lowering them into chocks. It may seem out of place to you, gentlemen, all of whom are supposed to be experts in devices for the management of boats and ships, for me to say so much on so small a thing; but in these days of collisions and maritime suicides it may not be in vain for me to go into these minute details, in the hope that some precious lives may be saved by adopting a simple boat davit. It may be a small thing to allude to the usual manner of arranging the tackles of boats; it is usual and I may say customary in the boats of merchant ships, and invariable in coasting steamers to place a ring in the stem of the boat somewhat far down out of the way and a swivel hook in the lower tackle block; now, in lowering a boat not provided with a patent detaching apparatus which no stranger knows how to operate, when she strikes the water down falls the heavy block, and so jambs the hook and ring that it is not

very easy to unhook it, especially if as usual the boat is bobbing up and down, and instances are not rare of jammed fingers, and of the bow being first unhooked, when the painter not being led along forward, round swings the boat and she swamps or is so entangled that she must be cut adrift. In my arrangement, as illustrated in the model before you, the ring is placed in the block, and the hook is a permanent fixture in the boat. Every seaman can easily appreciate the simplicity and usefulness of this plan as a life-saving and finger-saving device as compared to the other. I trust you will pardon me for saying so much on so small a matter. I beg leave to present to you a small pamphlet just printed and for sale by Messrs. A. Williams & Co. entitled "The life-boat and other life saving inventions." It is mainly copied from the "Journal of the National life-boat Institution for Aug. 2, 1880" by permission of the authorities thereof and contains very little original matter. My intention was to circulate freely a large number of this brochure on the occasion of the celebration of the 250th anniversary of the settlement of Boston, on the 17 instant, but, owing to circumstances beyond my control, it could not be done, and so I conclude to make the most of them by distributing them among personal friends and selling to those who choose to pay a small sum.

Regretting that my health prevents my reading this paper myself,

I am, very respectfully, your servant,

R. B. FORBES.

Sept. 30, 1880.

BREAKING UP OLD GUNS BY DYNAMITE.

Two old guns, captured from the Turks, were destroyed, in Dec. 1879 by Capt. Elsner, in the following manner. The guns, one 9.5 cm calibre, 1.52 m. long, the other 10 cm. calibre, 65 cm. long, with flaring mouth 17 cm. in diameter were fastened upright by burying their cascables in the earth; the vents were then plugged and the bores filled with water. The first gun was charged with 0.96 kg. of dynamite, held in two cylindrical zinc boxes, 15 cm. long and 5 cm. in diameter, which were lashed butt to butt with projecting strips of wood lashed to the sides. By this means the charge of dynamite was brought in line with the trunnions, 23 cm. above the breech. An ordinary priming cartridge

with a Bickford fuze was attached to the upper charge and ignited. After the explosion, the cascable remained in the ground while the end of the chase, 30 cm. long, with a strip 6 cm. broad, blown from its side was found about twenty paces off, the remaining pieces, averaging from 15-20 cm. in length and from 6-10 cm. in width being scattered about within a radius of one hundred paces.

The second gun was charged with 0.72 kg. divided into one charge of 0.48 kg. with two of 0.12 kg. tied beside it. It was fired in the same manner as the first but the bottom of the bore was filled with stones to bring the dynamite in line with the trunnions. In this experiment, the cascable was split, and fragments of the gun, averaging from 10-15 cm. in length and from 6-10 cm. in width were scattered about within a radius of one hundred and fifty paces.

In examining the charges of dynamite hitherto employed for breaking up cast-iron guns, no agreement as to the necessary quantity can be found. Part 1, for 1875, of this Journal records the results of some experiments made in France, shortly before. The guns broken up with dynamite (No. 1) were one each of the following calibres, 16.4 cm. (30 pdr.), 15.3 cm. (24 pdr.), 13.4 cm. (16 pdr.), and a 32 cm. mortar. The charge of dynamite was divided into three parts, one being placed in the base of bore, one in the axis of the trunnions, and one in the muzzle; all three filling the bore completely, the spaces between being filled with water. The estimation of the distributed charge necessary was arrived at by the following formula:—

$$L = 77.4 \frac{R^3 - r^3}{r^3} \qquad (1)$$

in which r is the diameter of the bore in mm., R is the distance from the axis of the bore to the outside of gun in mm., and l the amount of dynamite necessary, in grammes.

During the same year, two cast-iron guns of 12 cm. and 13 cm. calibre, were broken up by dynamite (No. 1), in Ingolstadt. One charge only was used—placed probably in the bore, opposite the thickest part of the gun, the remaining space being filled with water. Before explosion the gun was lowered into a pit, where it lay at an inclination of 45° to the horizon, against the side of the pit. The estimation of the amount necessary to destroy the gun by means of a single charge was obtained from the following formula:—

$$L = 0.0001\ Q.\ Kg. \qquad (2)$$

where Q is the weight of the gun in kilogrammes. This gives one gramme of dynamite for ten kilogrammes of iron. The charge taken for the 12 cm. gun weighing 1650 kg. was 0.165 kg., and for the 13cm. gun, weighing 2360 kg. was 0.236 kg., and by them the guns were blown into twelve or fourteen pieces.

Let us compare the results obtained with the German 13 cm. gun with those given by the French 13.4 cm. gun, weighing 2220 kg. According to formula (1), there was needed for the French gun 1.47 kg. in the base of bore, 0.747 kg. in the axis of the trunnions, and 0.658 kg. in the muzzle; a total charge of 2.447 kg., ten times the amount placed in the German gun. The latter was blown into twelve or fourteen pieces and the former into one hundred and thirty pieces, the largest weighing 158 kg.

The heavier Turkish gun, weighing between 450 and 500 kg. was broken into about fifty pieces; the lighter, weighing between 370 and 400 kg. into about forty pieces. Applying formula (1), we have for the heavier gun r=47.5 mm., R_1 for base of bore=200 mm., R_2 for the trunnion axis=140 mm., and R_3 for muzzle=130 mm. These values substituted give l_1=1295. grm., l_2=594. grm., l_3=502. grm., a total charge of l=2.3911 kg, more than two and a half times greater than the charge used. But by formula (2) we find the charge required for this gun, L=50 grm. to be only one nineteenth of the amount actually used. For the lighter gun we have R_1=200 mm., R_2=160 mm., R_3=110 mm., and r=50 mm.; and by substitution in formula (1) we have l_1=1161 grm., l_2=715 grm., l_3=297 grm., a total charge of 2.173 kg. But from formula (2), we have L=40 grm., and we again find a large discrepancy in the size of the charge required. From formula (2) there can be found the minimum charge of dynamite which will break a gun into large fragments. In formula (1), it is obvious that the ratio of the charge increases as the calibre decreases.

In Part 17, "*des Technischen Unterrichtes fur die K. K. Genie Truppe*, we are directed in estimating the explosive charge for cast iron guns to reckon 0.1 kg. of dynamite for each centimetre of the calibre of the bore. From this we would have for the larger Turkish gun of 9.5 cm. calibre, 0.95 kg. of dynamite which was the amount used in the experiment.

Translated from the Mittheilungen über Gegenstände des Artillerie und Genie-Wessens. 1880, *5th Part by Prof. C. E. Munroe.*

ON TORPEDO BOAT TACTICS.

Translated from the Mittheilungen aus dem Gibiete des See-wesens. (Vol. VII, No. 4.)

By Thomas Brassy Esq., M. P.

We are informed that the Russian Navy was supplied with no less than one hundred and twenty torpedo boats in the course of last year. To train the crews, and establish a definite system of torpedo tactics, twelve of these boats were kept in commission last summer; and thus the commanders who had completed the greater portion of the torpedo course, as well as the crews, had an opportunity of making themselves familiar with the method of handling these boats, and with the system of torpedo manœuvres generally. The experiences acquired in the course of the commission have been brought together by Lieut. Witheft. They were discussed at a conference of officers belonging to the Torpedo School and the Navy generally, and they are epitomized in the following paper.

Torpedoes were employed most extensively in the American war, and no less than forty ships were destroyed. The greater number of these ships were blown up by defensive torpedoes, and only a small portion by the offensive torpedo. The conditions of torpedo warfare remained unchanged until the successful results of offensive operations in the Russo-Turkish war encouraged the Russian Government to order the large flotilla of torpedo boats already referred to. It was in that war that the aggressive torpedo, in the hands of adventurous and daring men, was shown to be a weapon capable of being used with the most deadly and decisive effect, and, after a certain amount of successful practice in the management of these small crafts, it clearly appeared that they could be employed as aggressive weapons, with much less risk than might be inferred from the results of the earlier attempts, which had been made in America. To insure success, you require a good *materiel*, and the boats must be managed by men trained to the peculiar and hazardous service which they will be called upon to undertake. Every division of torpedo boats should be instructed how to conduct an attack with every prospect of success, without the support or coöperation of any other naval arm. In the recent Russo-Turkish war, nine attacks in all were made with torpedo boats; viz., 1, by Dubasoff and Schestakoff, on the Danube; 2, in the roadstead of Batoum; 3, by Skridloff, on the Danube; 4, by Niloff, on the Danube; 5, by Puschtschni, Zatzarennyi, and Roschdestrocuski, at the Sulina mouth; 6, in the roadstead of Soukoum-Kalé by Zatzarennyi, Pisarews-

kyi, and Wischnewetski; 7, in the roadstead of Batoum, by Zatzarennyi and Schtschetinski. The remaining attack was conducted by submarine mines in the Sulina mouth of the Danube.

When we come to examine the incidents of each of these attempts which were attended with a greater or lesser measure of success; without entering upon a general criticism of the campaign, it will be remarked that every attack was successful when undertaken according to a well matured plan by a group of torpedo boats; and that no attack succeeded that was made by a single boat. As an illustration, we may point to the attack made by Dubasoff and Schestakoff on the Turkish monitor, to the attack made by the boats of the Constantine in the roadstead of Soukoum, and to the attack on the guard ship at Batoum, by the boats of the Constantine, with the Whitehead torpedo. All the other attacks were unsuccessful, including the solitary attacks by Skridloff and Niloff, as well as the attacks, which were undertaken indeed by a group, but in which one of the boats, owing to undue precipitation, made an attack unsupported. Thus it happened in the first expedition against Batoum, and in the attacks at the Sulina mouth.

When we turn to the equipment of the torpedo boat, the first and most essential point is, that the torpedo and the torpedo boat should, so to speak, form one single weapon, so that the attention of the commander may never be divided between the conduct of the boat and the handling of the torpedo. A second essential is, that the arrangements should be such as to secure the instantaneous explosion of the torpedo, without the chance of a miss-fire. These two conditions apply more to the case of the torpedoes which are fired automatically, or by electricity. There must be a double set of conductors for the electric fluid, and the igniting apparatus must act upon receiving a slight blow. The equipment of the spar torpedo requires that all the gear should be exposed. This is not the case with the Whitehead. To hit a target of the size of a ship with a spar torpedo demands no peculiar dexterity, although the attack often fails from the colliding of the boats engaged. On the other hand, the success of the attack is certain, if the blow has been dealt home. The assailant know precisely what is taking place and the fate of his adversary is decided before his eyes.

There are not many advocates for the towing torpedo. As a means of attacking ships, which are protected by barricades or other obstructions, (and we must expect hereafter to deal with obstructions of that nature) this torpedo may be reckoned as altogether ineffective. Again there is great risk that the tow line will foul the propeller, as happen-

ed in the case of the boats of the Constantine on two occasions. Opinions are generally in favor of fitting boats with spars carried on the side. Although this method has been definitively adopted, it may not be superfluous to state the reasons why torpedoes so fitted have been found useless on certain occasions. The advocates of the towing torpedo insist on the facility with which the enemy may be attacked on the broadside, without slackening speed on the part of the assailant. Such an attack is almost free from danger to the assailant; but it does no injury to an enemy protected by obstructions. The harmless explosions will only steel his courage and accustom him to await calmly all future attacks. The attack with the spar torpedo presents some points of difficulty. The boat may be too far from, or perhaps some feet too near the enemy's ship. In the former case, the automatic explosion inflicts little damage: while in the second case, that, namely, when the boat is too near, and the spars cannot be extended to their full length, it may happen that the explosion may cause damage to the boat itself. These are the grounds on which the use of the spar torpedo on the broadside does not altogether commend itself.

It is usual to supply torpedo boats with drifting torpedoes. In order to use them it is necessary to place the torpedo boat in the path of the enemy's ship, the impact of which causes the torpedo to explode. The chief defect of this description of torpedoes consists in this, that they explode not under the ship, but at the water line. Hence if the ship be protected by nets or other obstructions, the torpedo can inflict no injury. The ship can be struck only when several torpedoes are fired in succession, and an opening is thus made in the obstructions. Even in this case, however, success is far from certain. In addition to this, where there is an ebb and flow of the tide, the drifting torpedo is as dangerous to your own ships as to those of the enemy: and at night, more particularly, it is impossible to get out of its way. Drifting torpedoes are therefore to be used by the torpedo flotilla, only in cases where the attack is being undertaken according to a plan laid down beforehand, with sufficent accuracy, and it can be known to every man taking part in the expedition, where and when the torpedo is to be used. Having recognized these two important defects, it may be inferred that these torpedoes are chiefly valuable as a means of destroying the *morale* of the enemy, and fettering his movements by the apprehension that he may possibly encounter one of these weapons every time his ship is brought to a stand-still. As an engine of destruction, these torpedoes cannot yet be accepted as practically effective.

From this general view of the *matériel* of torpedo warfare we turn to the tactics to be employed in the use of these weapons. It has already been observed that an isolated attack with torpedo boats must only be attempted in exceptional circumstances. It must be assumed that the vessel which it is proposed to attack is protected with nets or floating obstructions. If a division of torpedo boats is available for the proposed attack, it will be desirable to break up the division into three groups, to each of which a special duty will be assigned. Further, each boat in the several groups must confine itself to the special task which has been assigned to it. Assuming that the enemy is effectually protected by obstructions, nets, or other barriers, the first group is required to remove them. The second group makes the attack. The third group is held in reserve. Their task consists in rendering help and filling up any losses caused in the two leading groups by the defence of the enemy. As soon as each group has been completed, and their precise duties have been assigned to them, the operations must be carried out according to a well-considered and well-defined plan.

The pioneer group after their task has been completed will fall back into the reserve. The attack must be made simultaneously by the boats of the attacking group. The speed of all the boats must be regulated by the speed of the slowest boat. The commandant of the division, who must take his place in one of the boats of the reserve division, gives the signal for the attack. The highest speed of the slowest boat should be made the maximum speed as long as possible, so as to ensure that each boat shall come up to the attack at the right time. The farthest stations will be assigned to the slowest boats, so that all may come up with the enemy simultaneously. The engines should be slowed at some fathoms distance, and should be reduced to half speed when about twelve fathoms from the object. By adopting these dispositions it is possible for the commandant of the boats to satisfy himself that his own spar, with the torpedo attached to it, remains uninjured up to the last moment before the blow is delivered, that it is clear of the spars rigged out from the other boats in the group, and that the electrical firing gear is in order. It is to be observed that the risk of injury to the electrical explosive apparatus is not so great as when submerged spars are used. The electrical firing gear should be used only when the automatic gear fails; otherwise it may happen, if the distance has been misjudged, that the torpedo will be fired too far from the object. The torpedo should be brought under the ship's bot-

tom. If the Whitehead torpedo is used, care should be taken not to aim at a vessel amidships, for there the armor is carried down to a considerable depth under water. A spar torpedo will in case of necessity be used against a perpendicular broadside. The effect of the explosion, the torpedo striking at an acute angle, will in most cases be greater in proportion as the centre of the charge is brought closer to the ship's side.

From what has been said it will be obvious that, in order to ensure a successful result, the attack should be made from at least four points before or abaft the beam, whether on the port or starboard side. For such an attack there will be required four pioneer boats, to clear away the obstructions round the ship, four boats to make the attack, two boats in reserve, and one for the commander of the division—in all eleven boats.

Even supposing the newest type of torpedo boat to possess contrivances for closing all apertures simultaneously, experience proves that officers, as well as men, prefer to make the attack with open hatches, a circumstance which would probably be the cause of some loss of life. This can, however, scarcely be a point of serious importance, since a torpedo boat with a speed of ten knots would only require 4.8 minutes to pass over a distance of fifteen hundred metres exposed to the enemy's fire. The prospect of great loss of life would delay, or even entirely defer, an attack, although in former times many boat expeditions and boarding attacks, requiring much more determination, and involving the probable loss of many lives, have been carried out successfully. The attack by torpedo boats is, in fact, a kind of boarding attack under far more favorable conditions for the attacking party than in the old days, the cutlass, the boarding pike and the battle axe having been supplanted by electric and automatic firing apparatus. If only five of the eleven torpedo boats sent forth on an expedition return uninjured, they will have succeeded in their task; the other six will only have performed their duty, and their loss will be fully repaid by the destruction of the enemy's ship. The results of the attacks by torpedo boats in the course of the late war, which were carried on latterly almost without any loss on the part of the assailants, cannot be regarded as very considerable. In the future, we shall probably have to deal with enemies more determined and alert, and a more serious loss in men and *materiel* must be anticipated. When a boat is destroyed in the attack it does not necessarily follow that the crew should lose their lives. The attack must be made stealthily, so as not to attract

the attention of the enemy. This will not be so easy in the future as in the last Russo-Turkish war, although it is true that in that war, boats of a speed of from six to eight knots were used, while the new boats will make their attack at speed of thirteen knots.

It is difficult to give any positive opinion as to whether it is best to make an attack in broad day light. In very dark, stormy nights, the enemy will generally be more watchful. A single ship can scarcely be defended effectually, even in the day time, against a flotilla of torpedo boats. Our present experience scarcely enables us to say whether the attacks in the day, or those in the night, have the best chance of success, even assuming there may be a greater loss of life in the former. It may happen that you find an enemy who, having observed a division of torpedo boats coming down upon him, has made every preparation to repel their attack; but it does not follow that he may be able to make an effective defence. Here it would seem that the chances of success are greater in a daylight attack. A ship attacked in the night can make use of the electric light; the assailant should endeavor as long as possible to keep out of sight, and therefore the torpedo boats should be painted of such a color as to be the least conspicuous under the electric light. The usual dark grey colors are conspicuous, inasmuch as they appear much lighter, and indeed become a pure white when seen by the electric light. Experiments in the Black Sea showed that a light brown or chocolate was the least conspicuous color.

It is to be remarked that no special code of signals has yet been devised for torpedo boats. In the absence of these two boats belonging to the same fleet may possibly attack one another. The equipment of the torpedo boats with machine guns deserves very careful consideration; it is still difficult to pronounce an opinion as to their suitability. In making an attack it will be impossible to open fire with these weapons; they can be employed with effect only against boats, or to cover a retreat. The pyroxyline rockets may be found more useful: they have been supplied to torpedo boats; they do not load them too deeply, take up little room, and can be used with equal advantage for signaling purposes both in advancing to the attack and in retiring. The explosion of these rockets on board the ship which is attacked would create no small confusion.

The general conclusions to which we have been led by the foregoing observations on attacks by torpedo boats may be summed up as follows:———

1. Attacks by single boats are only to be attempted as a last resource

2. The attack must be made according to a carefully considered plan.

3. The torpedo boats are to be equipped with either the Whitehead or the spar torpedo.

4. A squadron of torpedo boats must be divided into groups; the pioneer group, the assaulting group, and the reserve group.

5. The torpedo should be fired automatically, and only when this plan fails should the electrical firing apparatus be employed.

6. Thespar should be sunk as soon as the boat is reduced to half speed or stopped. At full speed the spar should be triced up clear of the water.

7. The attack should be made, at a signal from the commander, simultaneously from several points,

8. The speed of the torpedo boats before the attack, until they reach the positions which have been assigned to them, should be regulated according to the speed of the slowest boat.

9. The commander of the division should remain in the rear, with the boats of the reserve group.

10. The torpedo must be brought in contact with the bottom of the unarmored ends of the ships.

In order to be able to apply all these rules effectively in war, it is necessary in time of peace to train every torpedo division to apply them as far as possible, under the conditions which would arise in actual warfare. This would be easily effected if the manœuvres of an attack were intelligently put in practice according to a predetermined plan, against a fleet at anchor and under way, with dummy torpedoes. At the end of the course of instruction, an attack might be made as a test of the efficiency which had been attained with loaded torpedoes against a raft or pontoon towed.

It is only after considerable practice that success can be obtained in this new method of warfare. Trials with single boats can only be regarded as a preliminary to manœuvres with a complete division of boats. They in no way ensure success when a boat is for the first time attached to a division, without having been exercised in making attacks of a similar nature in time of peace.

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ERRATA, NO. 13, VOL. VI.

Page 258, line 34, constant should read *constant*.
" 259, " 16, for Agricoca, read Agricola.
" 259, " 16, for De Re Metallica, read "De Re Metallica".
" 259, " 18, for Brindjonc, read Brindejonc.
" 259, " 19, for Oerochalinos, read Aerochalinos.
" 259, " 26, for Fulton, read Sutton.
" 259, " 39, for Iouchon, read Souchon.
" 259, " 39, for Defaix, read Desaix.
" 259, " 39, for Ichiele, read Schiele.
" 259, " 40, for Poisenille, read Poiseuille.
" 259, " 40, insert after Williams, Reid, 1844.
" 259, " 40, for Beaumaoir, read Beaumanoir.
" 259, " 51, after Thompson, '73, insert Thomas, '73.
" 259, " 52, for Yaum, read Yarrow.
" 259, " 53, for Dr. Gibbs read Dr. Gibbs', .
" 259, " 56, insert commas after Roddy, Delano and Norton.